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Moscow PRAVDA in Russian 17 Aug 86 p 2

[Interview with N. V. Gorshkov by O. Mikheyev; "Industry of Informatics: Speed Up Scientific Technical Progress"; date and place not specified; first paragraph in boldface in text]

[Text] The press has reported the creation of the All-Union State Committee on Computer Technology and Informatics. A PRAVDA correspondent met with N. V. Gorshkov, the new Committee's chairman, and asked him a number of questions of interest to many readers.

[Question] What tasks are entrusted to the State Committee?

[Answer] The Committee's main task is to combine the efforts of ministries and departments in order to create and effectively use modern, highly efficient and reliable computer technology and to have a unified scientific-technical policy in this area. The domestic informatics industry should be organized and developed under the Committee's leadership. This industry will be based upon automated technology and means for the creation, storage, production and effective use of software and upon the creation and effective introduction of data and knowledge bases for various subjects, with potential widespread access by all categories of users. The informatics industry also means the development of local, territorial and state computer networks, including hardware from supercomputers to microcomputers and means for data transmission. Finally, the informatics industry will also include a computer education system for all layers of society.

This industry exists; tens of thousands of computers and programs are being produced and specialists are being trained. However, it must now be organized and expanded so that it can much better meet the demands for a radical switching of the national economy to the rails of intensification and so it can handle the acceleration of scientific-technical progress. This is why our Committee was created. We are entrusted with the management, coordination and control of programs for the use of electronics in all spheres of the national economy.

[Question] On what base is the committee being created?

[Answer] On the base of the appropriate units, enterprises and organizations in the USSR State Committee for Science and Technology, USSR Gosplan, USSR Gossnab and several ministries and departments.

Among the fundamental and primary units in our system will be organizations which we still call centers for computer services (TsVU). These will be based upon units now in USSR Minradioprom [Ministry of the Radio Industry], USSR Minpribor [Ministry of Instrument Making, Automation Equipment and Control Systems] and in the USSR TsSU [Central Statistical Administration] which service computer hardware. These organizations' functions and tasks will be considerably expanded. At the same time local organs of the TsVU should become the legislators of computerization in oblasts and industrial centers.

TsVU will provide an entire set of computerization services directed towards the maximum use of computer centers' potentials in their regions. They will do technical servicing and repair work on computer hardware, organize the training of specialists and distribute software.

Centers for computer service will be part of production associations, which are appearing in all union republics and large economic regions. Plants for repairing computer hardware, software plants, scientific-training centers and territorial algorithm and program funds will also be included in these associations. The Committee system will also include scientific production associations which, jointly with the USSR Academy of Sciences, will solve basic and applied problems in the informatics industry.

[Question] How will the network of our centers relate to territorial computer centers for collective use which are operating within the TsSU? Won't there be parallelism here?

[Answer] Because our Committee will manage the entire informatics industry and because the parallel development of the two territorial networks with similar functions would really be wasteful for the state, I think that their merger into a unified network would be in the national economy's interest. However, this is a question for the future.

[Question] Precise organizational documents are necessary to bring order into the use of computer hardware and software and to coordinate work. What, in your opinion, should be their basis and what should they reflect?

[Answer] Yes, we must develop new normative documents on the use and development of computer technology and informatics. In our view, among the points in these documents should be the obligation of all ministries and departments, without exception, to, first of all, strictly account for all software being developed, secondly, to set up, in a planned manner, sector data bases and, in the future, knowledge bases with the possibility of quick access to them by all who require it. For example, specialists at any plant should have the possibility to obtain, through a computer at their enterprise,

information from a sector data base on how problems are solved at other plants in the country or abroad.

Also needed are normative documents which would regulate the legal status of information going outside a computer center's walls. These are necessary in order to increase the responsibility of workers producing information for the reliability of that information.

[Question] Industrial technology and planning should finally replace cottage technology for program development and the lack of coordination. How will this occur?

The needed order in software has still not really been attained. In the past 10 years hundreds of programs have been created in the country. However, the overwhelming majority of them have not reached the standards needed for their mass use. Therefore, they have not been registered in the All-Union Fund and are not being distributed as finished products. This work has been poorly planned and coordinated.

At the same time, the number of computer users and the costs of programming are growing rapidly. This complicates the problem. Its solution requires creating a state software system as a major component of the information science industry. This system's tasks would be to study society's requirements, and to plan, develop and produce software.

I want to note that we will entrust TsVU not only with the obligation to recommend, from the "outside" various modern programming technology to programmers. The TsVU will be given all the necessary apparatus and program development tools, mathematical models and modeling systems, test equipment for debugging and testing finished products, and advice from highly qualified specialists.

We will register and store all programs so developed at the State Fund for Algorithms and Programs, inform users of them and copy them at software plants.

[Question] How will the Committee influence the training and retraining of cadre sneeded for the national economy's computerization? As you know, there are also several problems in this area. Not only is teaching sometimes poor, but those taught are not always utilized properly.

[Answer] We think that computer education should be very different than it is today. People should be trained in subject matters and on stands and mockups simulating specific production and job situations. The main thing is to arouse their interest in independent searches for the effective use of computers in their work, be they doctors, designers, teachers or bank employees.

This requires setting up a general state system for educating computer specialists and users. This system should study the demand for their training, plan it and improve training quality. It will include our training centers and organizations in Minvuz [Ministry of Higher and Secondary Specialized Education], Minpros [Ministry of Education], Gosprofobr [State Committee for

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Vocational and Technical Education] and institutes for improving qualifications at ministries and departments. Of course, special attention should be given to computer education in schools, which is expanding greately in accordance with the school reform.

[Question] The reliability and techno-economic standards of computer technology is still a painful question. How will the committee influence solutions to this problem?

[Answer] Improvements in reliability are a difficult problem. It is necessary to strengthen technological discipline at plants, smooth out and automate production. It is especially important to improve the reliability and quality of parts and accessories.

Computer quality does not now really satisfy users. The low reliability of personal computers is especially noticeable. It is PC's which will soon make up the overwhelming majority of computers in the country. Their use can have a large economic effect. However, they are also capable of causing considerable economic harm if their reliability is not increased by 10-20 fold compared to previously produced machines and if an efficient service system is not created. Without this there is a risk that after their first breakdown a large number of such computers will simply become decoration at institutions.

The Committee will also include a State Inspectorate for Computer Technology Quality. Its attention will be concentrated upon improving the quality of technical decisions at the scientific research and experimental design stage.

[Question] Nikolay Vasilevich, the editors' mail often includes letters complaining about service organizations who dictate their will upon customers, and have a monopoly on spare parts. What sort of economic mechanism do you suggest to eliminate such phenomena?

[Answer] The problem is that today there is no computer technology and informatics economics. I think that to a considerable degree this is the reason why high technology equipment, which has cost the state billions of rubles to manufacture, actually has nothing to do for many "owners." This field of knowledge must be created anew. It is necessary to estimate the real, and not the pseudo national economic effect from the use of computer technology.

TsVUs' economic welfare must depend upon the quality of services provided. Together with users they should bear economic responsibility for norms for the hours of effective use of machines they service. Incidentally, it is necessary to refine, or more accurately, strengthen these norms. Effective machine time must, obviously, be considered that time used to solve problems on computers.

We also suggest that new forms of "supplier - customer" economic relations be tested. One such form could be the renting of computers rather than their purchase at full cost. Rental payments would be made only if the machine were working. They would stop, and so would the suppliers' "accounts" if there were technical problems. Only net, effective machine time should be paid for.

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If it is greater than normal the supplier would be paid a bonus, while if it were less the payments would stop. Incidentally, most computers abroad are rented rather than sold.

In our opinion such a form will give equal consideration to the interests of developers, suppliers and customers.

[Question] Isn't the time for setting up the Committee being stretched out? When will the first practical steps be taken?

[Answer] Much has been done. It is a large responsibility and the tasks are complicated. However, time will not wait for anybody. We are rapidly learning the work entrusted to us. I am confident that we will handle it successfully. After all, the country has many excellent specialists who love their work, there is good experience and notable scientific and production collectives. They are capable of any tasks. I hope that after some time we will be able to report to PRAVDA readers on the first work done.

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INFORMATION APPROACH TO COGNITION AND MANAGEMENT

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[Article by Eduard Semenyuk, doctor of philosophical sciences and senior scientific associate from the Social Sciences Institute of the Ukrainian SSR Academy of Sciences under the "Methodology of Science" rubric: "Information Approach to Cognition and Management"]

[Text] The idea of the imminent interconnection between information and management, which became the fundamental principle of cybernetics from the moment N. Weiner's classic work was published, was developed further and more deeply during the course of the formation of an information approach to the congition of activity as a special scientific phenomenon. This process was an organic component of the cybernetization of modern science and was inherently connected with the qualitative change in the cognitive role and scientific status of the concept of information as well as with its growth into a universal scientific category. The magnitude of the concept of information and its use in science expanded steadily in proportion to the development of cognition, and its heuristic possibilities and scientific potentials became increasingly obvious.

In brief, it is possible to say that the main gnosiological content of the new approach consists of the computation and analysis of precisely the information aspect of the most diverse phenomena under study. It organically fulfills its material and energy aspects, the knowledge of which historically began significantly earlier and therefore already has rich traditions. Information has gradually come to be perceived as a special, specific phenomenon and hence is not reducible to its material and energy substrate. It is also rather important that it serve as an "apex" with the broadest possible viewing angle, thereby unifying the study of objects of any sphere of reality and practically any nature into a specified plan.

The establishment of the theory of information, the first scientific discipline that was straightfowardly and directly connected with the study of information, was the initial impetus toward the birth of the information approach to cognition. However, in view of the methodological characteristics of this area of cognition, attention to the formal and quantitative parameters of information transmission dominates. The qualitative characteristics of information, its content, sense, novelty, value, usefulness, etc., are

intentionally ignored in the process and simply not included in any examination in order to simplify the matter. The aforementioned explains why the theory of information could not, by virtue of its nature, become the direct basis of the evolution of the information approach to the congition of qualitatively diverse phenomena of reality in all its breadth and depth. It could only provide the first push for its constitution (but this is certainly very important). As a direction of scientific research that is much broader with respect to its tasks and that organically unified a number of disciplines (including, moreover, the theory of information in its foundation), cybernetics could objectively fulfill such a role to the full extent and really did do so. It was precisely cybernetics that attracted the attention of scholars and specialists of the most diverse profiles to the content aspects of information and its immanent connection with management.

As is well known, the most important feature of cybernetics is that it discovered the fundamental structural commonality of the processes of communication and management in qualitatively different spheres of reality--in living nature, society, and human cognition. The following fact is of primary importance in understanding the genesis of the information approach: the heuristic nature and scientific value of the broadest generalizations on a nontraditional, continuous foundation were clearly demonstrated in cybernetics. Methodologically, the information approach is without a doubt nothing other than one of precisely those generalizations of a set of previously disconnected scientific facts, concepts, ideas, conceptions, and even theories on a unified base that has already been specified by the "viewing angle" of the researcher, i.e., an orientation toward the study of precisely the information aspect of reality. In other words, the given approach is a theoretical vehicle with a universal scientific scale.

This most-important feature of the information approach to cognition is inherently connected with the methodological nature of cybernetics. In addition, it is necessary to emphasize the noncoincidence and difference of the information approach (as it appears today) and cybernetics, although it has provided a most perceptible impetus to its organization in science. In this respect, it is particularly important to state the following: not infrequently, the information approach is called cybernetics (or, conversely, cybernetics has been called the information approach), and these concepts are, in essence, identified with one another.

It is incorrect to identify the information approach in its full volume and content with the cybernetic approach if for no other reason than because its formations have emerged together with the cybernetization of cognition by intrascientific factors and other important processes of modern scientific development (organically interconnected, to be sure, with the cybernetization of cognition, but still far from reducible to it): the mathematization of scientific congition, its integration (especially the establishment of complex, interdisciplinary problems and directions), the change in the style of the scientific thought of the epoch, and finally, the progress of philosophical and methodological research in recent decades. Thus, when noting the particular importance of the contribution of information theory and cybernetics as a whole to the formation of the information approach as a nontraditional theoretical vehicle, one must not ignore the role of a number

of other areas of science, above all, mathematics, general systems theory, and finally, philosophy as well as the primary importance of the tendencies toward integrating scientific cognition that have intensified with time.

Far more than this is involved, however. In addition to the intrascientific factors in the establishment of the information approach, extrascientific prerequisites have also existed that extend beyond the framework of the sphere of direct scientific activity (but not contradicting it and not deprived of an objective, scientific base) and that are related to social processes of the broadest scale. Above all, there is the marked growth in the total volume of information in society and in its role in social development that has occurred in recent decades. Under the conditions of scientific and technical development, the case where the optimality of management as both a science-technology-production system and complex of all natures of social processes, including economic, political, class, national and ethnic, demographic, cultural, etc, depends directly on the effectiveness of the organization and management of a management data base has manifest itself in full form. On the other hand, the growth in dynamism in the sphere of social information and the intensification of its flows and the deepening differentiation of its forms have become increasingly more perceptible. These social phenomena should also be expressed objectively in the development of scientific cognition, with the necessity of accentuating the attention of scholars precisely on the information aspect of reality. The refraction of this process in a methodological plan has meant the formation of a special, nontraditional approach to cognition.

The information approach, which appeared initially in individual branches of communications technology, has gradually conquered all new positions in cognition of the world. It has finally begun to be perceived as a phenomenon with a very high level of universality and applicability in science. It has been recognized that studying the processes of the interaction between two or more objects of nature from information positions is, in the majority of cases, if not always, able to yield interesting, nontrivial results. Above all, this is true for the cognition of living nature and especially for human beings of the most diverse sides of the development of society, their psyche, and activity.

It is evident that the fundamental scheme of all information interaction includes an information source, its receiver, and a communication channel between them as necessary components. The first step in analyzing the information component of any specific process of reality must, as is evident, consist of the qualitative separation of each of these components for the purpose of studying them further, both in themselves and in their interaction with each other (the prime consideration). In the final account, uncovering the specifically unique information role of each phenomen of reality is the task of the investigation. It is precisely in the course of a scholar's realization of the universality of this task that the information approach to cognition came together as a theoretical vehicle with a universal scientific scale.

An important feature of the given approach is that, since its very beginning, it has developed not in isolation from other cognitive instruments of science

but as an integral part of the total system of modern theoretical vehicles and, above all, in an organic unity with other formative universal scientific approaches, including the systems, structural, functional, model, and probability approaches, with the categories lying at their base and with all other forms and vehicles of cognition with a universal scientific rank, i.e., problems, concepts, investigative methods, theories, and even special disciplines.

The appearance of a qualitatively new type of universal scientific phenomenon (notably different by virtue of its features from previously existing, traditional vehicles with a universal scientific nature such as philosophical, logical, and mathematical vehicles) became an essential methodological feature of the stage in the development of science under conditions of the scientific and technical revolution. The unusual combination of specific scientific as well as mathematical and philosophical knowledge in these new universal scientific constructs, thanks to which, they appear to occupy an intermediate, transitional position between the special sciences of all complexes (including mathematics) and philosophy, is the most characteristic feature of these new universal scientific constructs.

Thus, the content and meaning of the information approach to cognition and its significance in science may only be understood and evaluated adequately in the context of this broader process, i.e., the establishment of a new, nontraditional type of universal scientific nature of cognitive forms and means. Only in an organic interrelationship with all other universal science constructs formed in the era of the scientific and technical revolution and only in an immanent unity with them can the information approach play a notable role in the development of ideas about management.

It is obvious that for a very long time human beings did not perceive the different types of management (in society, technology, and living nature) as one and the same common essence. The extraneous differences in them predominated to the extent that the deep unity of their inherent base was well hidden. The most important achievement of cybernetic theory is precisely that it revealed for the first time the fundamental isomorphism of the different specific manifestations of management and taught us to see beyond the external diversity of the parts to something fundamental and more essential in the content of qualitatively diverse processes. This made it possible to understand the meaning of management in its most universal meaning, outside a tie to any specific sphere of reality.

As Academician V. Afanasyev has emphasized, the antientropy nature of management and its orientation toward counteracting destructive effects and ultimately ensuring the effective functioning of systems of various types and natures in spite of all disorganizing factors is common to all varieties of management. He states, "In its essence, the process of management is the antipode of processes of disorganization that makes it possible to stabilize the system, preserve its qualitative specificity, maintain its dynamic equilibrium with the environment, improve the system, and attain some useful effect or another" [1].

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It is very indicative that it was precisely in the course of the information approach to cognition and in close connection with its problematics that many topics, which make it possible to understand management more deeply, were studied initially. Thus, the differences and common features of the main forms of management, the differentiation of its direct and mediated forms, the principles of the hierarchy in management, the concept of manageability, the principle of the fundamental simplification of management operations, and--as one of its essential components--the task of simplifying the information operations necessary to accomplish the goals of management have become objects of special analysis.

The most well-rounded and the clearest information approach appears in sciences about human beings and their cognitive and practical activity and society and its development. That higher forms of information (and also management) are inextricably connected with the human mind and its social existence is understood. And it is well within the order of things that the organic unity of information and management is perceived especially strongly precisely here, in the sphere of social processes.

The problem of the scientific control of processes of social development acquires a special urgency under the conditions of developed socialism: the scientifically established (but not pragmatic or voluntaristic) control of these processes is immanently connected with the very nature of communism and its first, socialist stage [2, 3, 4]. The concept of social information, which unifies all types of information in society, emerges as one of the important instruments for the investigation and practical solution of the given problem.

Inasmuch as material production, and more broadly, the sphere of economics as a whole is the basis of social life, the dominant form of social information is precisely economic information (above all, production as well as banking, trade and economic, etc.). The works of V. Nemchinov, N. Fedorenko, V. Glushkov, S. Bir, Yu. Chernyak, Ye. Mayminas, Ya. Khanelis, A. Mamikonov, and a number of other Soviet scholars are devoted to studying the different aspects of the theory of economic information and its significance for managing the economy. The information approach to production, planning, and managing the economy has developed especially quickly in recent times. The wide use of computer technology (i.e., information technology in its essence) for these purposes and the creation of information systems for economics has stimulated research on classifying and coding economic information and developing special information languages for this. By analogy with such an already-accepted term as "power available per productive unit or worker", the concept of the information available per worker and for management has arisen in economics, has undergone development, and is becoming increasingly more important.

In view of the deepening differentiation and specialization in science and social practice, many problems of prime economic importance are now being studied not directly in economics but by special scientific disciplines and directions that have already been put together or are only being formed at the junction of economics with technology and natural and social sciences. Some examples are industrial sociology, the scientific organization of labor,

reliability theory, engineering psychology, engineering aesthetics, standardization theory, patent science, production management theory, qualimetry (the science of measuring quality), production (labor) quality control theory, etc. It should be stressed that the information approach played (and continues to play) an important role in the establishment of these new, nontraditional disciplines and research directions. Most often, the results of such research have a very direct outcome into social practice, and they are directly connected with one area of management processes in society or another. Without them, for example, the creation of a number of complex production quality (or labor quality) control systems would be simply impossible.

There is yet another young and notably progressing area of knowledge. On an information base, forecasting solves problems arising beyond the framework of economics and relating to the most diverse aspects of the social life (see the works of J. Thompson, I. Bestuzheva-Lada, B. Kuznetsov, V. Lisichkin, E. Yanch, etc.). In essence, forecasting is nothing other than an advanced reflection of reality by a human being and society, and discussing this process as a specific form of modeling, information modeling of the future, is completely legitimate [5]. Moreover, forecasting in the area of social phenomena is connected with management in a definite manner, i.e., forecasts (long- and short-term) are, to a significant degree, the basis for making administrative decisions on different scales. Furthermore, in many situations the forecast itself has a direct effect on the further course of events and is the source of pulses of a management action on the development of forecast phenomena.

Science plays an exceptional role in our society. This is explained by two main principles: first, the intensification of the scientific and technical revolution and, second, the very nature of socialism. As was emphasized at the 26th meeting of the CPSU, "Without science, the Communist party proceeds from the fact that the construction of our society is simply unthinkable [6]."

The significance of the practical use of scientific achievements is particularly great under modern conditions. The idea that the cardinal acceleration of scientific-engineering progress is the main strategic lever for intensifying the entire economy of our nation passes through Party documents like a red thread.

The quick and effective introduction of the most recent generations of technology into all sectors of production and the revolutionary shifts in technology based on the newest achievements of science are the main path to intensifying the Soviet economy at the end of the 20th century and the material base for accelerating the entire Social development of the country. Hence the primary importance of the tighter and more limited integration of science with reduction in the common flow of scientific-engineering progress.

On the other hand, the increasing attention to science itself and to all aspects of its functioning and development is also understandable in this broad socialist context. In particular, this explains the special importance of effective forecasting, planning, development of science, and most of all, its management under the conditions of socialism.

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It is indicative that the task of managing scientific progress in its time was advanced precisely on the basis on an information conception of science that became the specific manifestation of the information approach in metascience which is a nontraditional branch of cognition that is called upon to examine science complexly as a whole, dynamic developing system that is being formed. It is entirely in the order of things that informatics, the theory of scientific information and communication processes in science, occupies a visible place in the total complex of disciplines comprising the study of science [7].

In recent time, the term "informatics" has been used increasingly frequently in another, broader sense as a designation of the field of automated information engineering and technology, a qualitatively new organization of all information processes in society on this basis, as well as as a name for the corresponding branch of knowledge. Such significance of the concept of informatics is connected above all with the revolutionary shifts in computer technology in the 1970s and 1980s as a result of the rapid progressive miniaturization of computer components.

French sources contain a comparison that clearly illustrates the progress in the capabilities of information technology. In the 1950s, the tube computer was equivalent to the human brain with respect to the number of functioning bits and equivalent to Paris with respect to overall dimensions. In the last decade, an analogous computer has already shrunk to the size of a building the size of the Grand Opera. The integrated circuits of the 1970s made it possible to place such an "electronic brain" in a bus and, later, into a television (by 1978 its size did not exceed the dimensions of a typewriter). Thanks to the use of microprocessors, in the 1980s such a computer had a volume less than that of the human brain.

It is understandable that these achievements of microelectronics have qualitatively altered the capabilities of computer technology in the storage and processing of information in society. Properly speaking, in essence, these devices are generally not so much computers as information devices in the broadest meaning of the word. They are intended to help human beings effectively in implementing information processes of the most diverse nature (including, as a frequent case, purely computational operations). As has been noted in a number of works, the name "computer technology" reflects the genesis of the concept and the etymology of the word more than their essence.

The changes in the nature of information engineering and technology lie at the basis of what has been termed the transition to "paperless" informatics. The fundamental capability of representing any (with respect to nature and content) fragment of social information outside the traditional paper form and, foremost, the capability of further operation using information while drawing in diverse technology constitute the essence of a similar type of informatics.

As Academician V. Glushkov has noted, "The majority of predictions that have been acheived up to now indicate that by the beginning of the next century in the technically developed countries the bulk of information will be stored in

paperless form, in the memory of a computer" [8]. The information service of the future will be conceived on the basis of connecting collective and individual users located at any point on the Earth to branched and deeply echeloned electronic systems based on giant banks of many-sided social information, economic, political, sociological, organizational, scientific, engineering, artistic, pedagogical, sociocultural, etc. It is precisely in this sense that another term, "telematics," is often used in the West together with the term "informatics."

Of course, the concept of a paperless informatics does not completely exclude (when necessary) the traditional recording of information on paper at any stage in its creation, processing, and use. The main thing in this concept, its heart, is the liberation of the human brain from burdensome, routine work with huge masses of information. This is the point of transmitting the maximal amount of information that is already unsuitable for recording on paper to a computer memory.

The unprecedented successes and rates of the development of informatics give as a qualitatively new sound to the entire information approach a specific scientific tool. This process has a number of directions, aspects, and specific manifestations.

Above all, the forms of data base management and organization and service to scholars has changed significantly as a result of the introduction of the acheivements of paperless informatics into practice. The era of these changes began already in the course of the wide use of computers to process scientific information with the most diverse content and for preparing scientific information publications, etc. In many respects, the personal computer increases the range of the capabilities of information technology in view of the fact that it gives the user an individualized nature. It is fundamentally important that the operation of the personal computer has been designed for a dialogue, interactive (i.e., active from both sides) nature of information processes. In the course of a dialogue with a scholar, the computer becomes a participant in retrieving information, evaluating it, and processing it and is not simply a mechanical executor of jobs and instructions formulated in the necessary language. This is a qualitatively new situation that has occurred in science at the boundary of the second and third millenia.

Up to now, the point of using computer technology in information work was mainly to have the capability of processing large files of information quickly. In other words, the case in point was the advantage of an extensive nature. Now it is possible to speak of changes of an intensive nature. The capabilities of obtaining necessary information have not only expanded but also become significantly deeper. Qualitatively new directions in the analytical and synthetic processing of information with the use of technology have arisen.

On-line teleaccess to any form of information, including during an interactive way of retrieving and rearranging it, has sharply increased the probability and range of the manifestation of associative intersections, connections, analogies, and other heuristic connections. The productivity of using information in scientific work has grown notably, signficant amounts of time

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have been saved, and qualitatively new capabilities of comprehending information fragments and whole files in their systems unity have been created.

Of course, the matter is not only limited to the sphere of scientific creativity. Literally all types of intellectual activity will experience the increasing effect of the new information technology. The fact that in the near future, thanks to the personal computer, the specialist or manager of any profile, whereever he or she is located, will be able to participate in abstentia in a meeting or conference of any level and in the process will not only hear the remarks of others but will also make an address himself or herself, exchange remarks, and participate in a discussion has very great significance. Unlike the long-existing selector, the information technology of the future promises, in similar situations, to provide almost the complete effect of a presence (which is extremely important on a psychological level). However, the aforementioned capability afforded to all ranks of managers by the personal computer and also ordinary specialists is no less important to the effectiveness of controlling social processes.

It is important to emphasize the revolutionary role of the personal computer in enriching the nature of information processes with the participation of technology in their qualitative development. In this scheme, great hopes are associated with implementating the design of fifth-generation computers, machines with artificial intelligence. Many prominent scholars have expressed the view that it is now dificult for us to completely imagine and estimate all the social consequences of the process of the computerization of society. Only now are specialists beginning to comprehend the many-sidedness of its effect on social practice including the different aspects of its possible effect on the spiritual life of people. This aspect of the problem is expecially timely in the context of the fact that by 1990 the world output of personal computers is expected to reach a level of 20 million per year. The rates of the development of the information industry are unprecedented.

In our times, it is as if the progress of informatics has given a "second breath" to the entire information approach and filled it with a new content and practical meaning. The fact that this is not only an approach to cognition but also to transforming reality is felt much more strongly and deeply than previously.

Like any other scientific approach (system, structural, etc.), the information approach has, since the very moment of its birth, included a transformational aspect. However, the degree of expression, "manifestness," share, and significance of any given aspect may of course change significantly in different periods. And this is precisely what is being observed now during the course of the revolutionary changes in the area of information engineering and technology. The very directivity of the problematics of the information approach is visibly evolving to the side of practical applications. However, minimizing its scientific and cognition function as an expression of the inherent logics of the development of science at the end of the 20th century on the basis of this directivity would be a metaphysical extreme.

The current rapidly increasing popularity of the term "informatics" is

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undoubtedly connected with its broadest meaning, with the entire sphere of modern information engineering and technology. However, in our view, it would be a mistake to completely ignore the other, narrower meaning of this concept, which has been reinforced by a large number of publications where informatics is understood as a special branch of knowledge tht studies scientific infor tion as the theory of scientific information activity, processes, and forms of communication in science. This second meaning does not contradict the first broader meaning but is, in a certain manner, subordinate to it. The objective necessity of isolating informatics as a special discipline of the metascience complex that concentrates its studies of information in science was in many respects determined precisely by the qualitiative shifts in the capabilities of information engineering and technology. The problematics of the information approach to reality as a universal scientific phenomenon is naturally inherently related to this specific (and not so "stylish" today) variation of the concept of informatics. In any case, in the context of timely management tasks, the most important trends in the development of information processes in science must undoubtedly be studied separately. That this is necessary is altogether obvious, even though the concept of an information environment was, in its own time, developed as an offspring of the theory of scientific information activity and the strategic task of managing the given environment for the purpose of optimizing it was put forth.

The share of "metainformation" has markedly increased with time in the sphere of data base organization and management for science and its management. (Footnote) (Metainformation is most often understood as "information about information", i.e., higher-order information derived from source information and, in its own way, adjusting it.) Therefore, with increasing perceptability, the effectiveness of managing science depends on optimizing the flows and forms of metainformation, and this intensifies the practical significance of studying the given topic. Generally speaking, for works in the area of metascience, informatics, documentalistics, and other closely related fields, an increasingly deeper unfolding of the organic interconnection of information and management characterizes the new directions of sci tific knowledge in the highest dimension. Without an understanding of this interconnection in principle, many components of general management theory, including the method of expert estimates, decision theory, and experiment-planning theory, that are extremely important in the era of the scientific and technical revolution, would not have developed.

The management of such specific subdivisions of science as its "plant sector," i.e., management of scientific activity directly at industrial and agricultural enterprises, agroindustrial complexes, and production and scientific production associations, has recently become a special object of study and optimization in our country. The social significance of this nontraditional form of management is well understood in light of the large-scale, multiaspect, and complex task placed before the Party, i.e., to accelerate scientific-engineering progress based on the tight integration of science and production.

The investigation of the information aspects of the interaction of human beings and technology in production and management processes (which has been determined by the rapid progress of equipping them with technology, in

particular computerization) has become a special direction of scientific search under the conditions of the scientific and technical revolution. The different aspects of this broad topic, the development of information and logic and management systems, as well as languages for man-machine "communication," debugging of the corresponding programs, and the selection of optimal operating modes, etc., are connected by many threads, not only with the engineering sciences, natural science, logic, and mathematics, but also with social science.

The current stage in the study of an expansive complex of ecological topics presents an even more evident example of the organic "linking" of the problematics of a number of branches of cognition. It is well known that in the era of the scientific and technical revolution the task of optimizing the interaction of humans and nature has taken on an exceptional social significance. We are not simply speaking of preserving the environment (which is impossible since the progress of society inevitably demands changing it), but of optimizing human intervention in nature and intelligent management of the biosphere. And in this scheme, of course, current and adequate ecological information is the most important management tool.

The merits of the branched structure of social information and its irreplacable role in management processes have long been evaluated in the social sciences studying phenomena with a superstructure nature such as specific sociology, demography, social psychology, law, military science, etc. However, here also the intensification of the scientific and technical revolution has introduced new elements into the development of the topics of information and management, which gradually have a direct output into social practice. For example, the existing methods and means of data base organization and management of the corresponding administrative organs are more frequently being combined with new, nontraditional information sources for making specific management decisions. These are specific sociological investigations (according to special methods, on the base of a well-developed understanding and conceptual and formal mathematical apparatus) and a social experiment, etc.

The unity of information and management is very visible in the training processes and, correspondingly, in the theory of training and education, pedagogy. The "information explosion" of recent decades has resulted in a keen perception of the truth that has generally been long known to educators: the purpose of instruction must not only be (and not even so much) the assimilation by students of some specified volume of information as much as the development of a knowledge of how to assimilate any information in the future.

The new impetus in the development and intensification of the information approach in pedagogy will undoubtedly communicate the already-begun widespread introduction of electronic information technology into the instructional process. As is well known, in March 1985 the Politburo of the CPSU Central Committee formulated specific measures for providing the computer literacy of students at secondary educational institutions and for the widespread use of computers in the instructional process. A decree was adapted concerning the introduction beginning with the 1985/1886 academic year of a course entitled

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"Principles of Informatics and Computer Technology" in all secondary educational institutions in the USSR and about the undertaking of a widespread experiment in using computers to teach different subjects. In other words, today the computer has been called upon to become an effective helper for teacher and student, and this new task will place a number of nontraditional problems concerning the information program before the teacher and school psychologist. These are related to the effectiveness of managing the process of computerizing instruction and attaining a high computer literacy in future generations of workers.

To get the full picture, it is necessary to remember sources of artistic and aesthetic information, art and artistic literature. In the scientific disciplines studying this form of social cognition, i.e., in art history, literary criticism, and aesthetics, the information approach helps in attaining a deeper understanding of the complex specifics of managability, both in processes of artistic creation and in the comprehension of works of literature and art.

It goes without saying that information concepts have a most important role in the theoretical analysis of the functioning of means of mass information and social effect (the press, radio, and television), on whose basis the theory of mass communication has been compiled. The scientifically established management of the processes and tools of the formation of social opinion is an organic component of the ideological work with the broadest masses of people. As is well known, this side of social life acquires a special significance under the conditions of the modern intensification of the ideological struggle between the two world socioeconomic systems.

In summary, it is possible to say the following: without exception, all sides of human life, whether a social entity or not, reflect in themselves the organic unity of information and management, and this fact is reflected by the entire spectrum of sciences about society. A significant amount of literature has already been devoted to the exceptional role of information in the life's activity of modern man and in the processes of social development.

For a more complete understanding of the topic let us mention only that the information approach in sciences about society has its natural science roots in the corresponding approach to genetics, physiology, and human psychology. It is precisely in the life's activity of the human organism as a natural being that all social phenomena are ultimately based. Discussing diverse phenomena of physiology and, especially, human psychology from information positions makes it possible to study the content of the information processes in society and the specifics of human perception of various forms of information more deeply and to thereby develop corresponding motives for behavior, management decisions, and management actions. Therefore, the further development of research uncovering the organic unity of information and management in different spheres of social activity is closely connected with accomplishing the cardinal task placed before Soviet scholars by the Party, i.e., to strengthen the interaction of social, natural, and engineering sciences and to ensure their decisive turning to the needs of social production and acceleration of the socioeconomic development of the country.

ENDNOTES

1. Afanasyev, V.G., "Nauchnoye upravleniye obshchestvom. Opyt sistemnogo issledovaniya" [Scientific Management of Society. Experience of Systems Investigation] Moscow, 1973, p 25.

2. Afanasyev, V.G., Ibid.

3. Afanasyev, V.G., "Obshchestvo: sistemnost, poznaniye i upravleniye" [Society: Systematic Nature, Knowledge, and Management] Moscow, 1981.

4. Markov, M., et al., "Sotsializm i upravleniye" [Socialism and Management] Moscow, 1973.

5. Ursul, A.D., "Problema informatsii v sovremennoy nauke" [Problem of Information in Modern Science] Moscow, 1975, pp 174-175.

6. "Materialy XXVI syezda KPSS" [Materials of 26th Session of CPSU] Moscow, 1981, p 42.

7. Gott, V.S., Semenyuk, E.P., and Ursul, A.d., "Informatics: Social role and Philosophical and Methodological Problems" FILOSOFSKIYE NAUKI, No 4, 1985.

8. Glushkov, V.M., "Osnovy bezbumazhnoy informatiki" [Principles of Paperless Informatics] Moscow, 1982, p 7.

MICROPROCESSOR FROM 'START' PROGRAM PERFORMS 2 MILLION OPERATIONS A SECOND

Tashkent PRAVDA VOSTOKA, 7 Jan 87, p 1

[Unattributed article]

[Text] A microprocessor developed at Novosibirsk's Academy City performs 2 million operations a second. From the standpoint of performance, the new processor surpasses ones now in production by two to three times. An important stage of research aimed at developing components for new-generation computers and testing them experimentally has been successfully completed. Scientists of Moscow, Tallin and Severodonetsk are taking part with the Siberians in accomplishing this task. They have united their efforts within the framework of a temporary scientific-technical team, "Start". Specialists of various industries have shown interest in the new microprocessor, which was developed in the course of carrying out a major research program. The Kama Automotive Plant was one of the first enterprises to receive it for introduction.

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AFFILIATE OF ACADEMY COMPUTER INSTITUTE DEVELOPS PERSONAL COMPUTER

Moscow PRAVDA, 24 Dec 86 p 3

[Article by I. Sergeyeva, correspondent]

[Text] Berdyansk, December 23--A personal computer with software has been developed at the Berdyansk affiliate of the USSR Academy of Sciences' Institute of Problems of Computerized Information Processing. It has been given to the health-resort polyclinic "Zhemchug".

Called "Spetsialist", this computer complex has helped to examine 1,400 patients of the Berdyansk health resort. Medical workers are satisfied with it: analyzing results of numerous electronic physiological examinations takes less time and can be done with higher quality.

This year the affiliate created a center for teaching specialists of enterprises and organizations the basics of computerized information processing.

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BROCHURE: MICROPROCESSORS AND PERSONAL COMPUTERS

Moscow NOVOYE V ZHIZNI, NAUKE, TEKHNIKE. SERIYA MATEMATIKA, KIBERNETIKA in
Russian No 5, 1986 pp 1, 2, 48

/Annotation and Table of Contents from journal by L.N. Korolev, professor at
Moscow State University and Corresponding Member of the USSR Acedemy of
Sciences: under the rubric "Mathematics and Cybernetics," signed to press
28 Apr 86, 34,700 copies, 48 pages1

/Text/ Annotation

This brochure is dedicated to a discussion of the possibilities, structural
organization and program support for microprocessors and personal computers,
the areas for their use in industry, instruction and automation of an
experiment. In conclusion, the modern status and prospects for the future
development of microprocessors and personal computers are discussed.

The brochure is intended for lecturers, students and teachers at national
universities.

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CSO: 1863/158

BRIEFS

FIELD COMPUTER SET DEVELOPED--A computer system developed at the Novosibirsk
Academic City is housed in the body of a cross-country vehicle. It is a
field computer set, intended for geologists, and is already being used at a
promising oil and gas site. [Summary] [Moscow 1130 GMT 5 Aug 86]

MAGNETIC MEMORY DISCS FROM REFINED ALUMINUM--Scientists and technologists at
the All-Union Institute for Aluminum and Magnesium have developed magnetic
memory discs from refined aluminum. Through adding a very small amount of an
alloying element into the metal it has been possible to ensure that they are
extremely stable in recording, storing and reproducing information with
electronic computers. [Summary] [Moscow 1130 GMT 5 Aug 86]

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CSO: 1863-41F

BROCHURE: OPERATING SYSTEMS

Moscow NOVOYE V ZHIZNI, NAUKE, TEKHNIKE: SERIYA MATEMATIKA, KIBERNETIKA in
Russian No 3, 1986 (signed to press 26 Feb 86) pp 1-2, 46-47

/Annotation, Table of Contents and Conclusion of article by I.A. Bakharev and
A.I. Gorlin: "Operating Systems," Znaniye Izdatelstvo, 33,760 copies, 48
pages/

/Text/ Annotation

Operating systems are discussed in this brochure -- complexes of programs
under the control of which all modern computers operate, their purpose and
functions, the principal hardware and software of computer
complexes. A review is furnished on the better known modern operating
systems.

This issue is for use by lecturers, teachers and students at national
universities.

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Conclusion

The experience accumulated in the development of_operating systems has shown
that despite actual successes in this area, OS /operating systems/ still must
travel a long path before perfection is reached, a path along which brilliant
discoveries as well as dead-ends will be encountered. However, certain trends
in the development of OS's can be singled out rather confidently.

The prospects for the evolution of operating systems are dependent upon the overall trends in the development of computer equipment -- reduced cost for hardware, increase in the speed of processors, growth in memory volume, reduction in the size of systems and development of communications equipment. Thus, in the near future we can expect a transfer of a considerable portion of the functions of OS's from programs over to hardware.

The spread of parallel languages requires greater effectiveness in the carrying out of parallelism from both hardware and operating systems.

The existing approach for operating systems and also for controlling computer resources will be retained, but changes will take place in the resources which they control. In particular, an OS will to a greater degree be viewed as a system for controlling data.

The spread of the concept of virtuality will give a substantial impulse to the development of OS's, such that the true machine will for all practical purposes be entirely "concealed" from the user.

The trend towards the creation of computer families, such as the ES or SM machine series, and hence families of operating systems, will be retained.

Future OS's will be easier to handle and they will be oriented to a greater degree towards carrying on a meaningful dialogue with man.

And finally, computers will be linked together in networks to a greater degree and this will lead to the creation of OS's in which the various functions of an OS will be carried out by various multipurpose and special processors, joined together in a single network.

In conclusion, it bears mentioning that knowledge of the possibilities and principles for the functioning of an operating system is required for intelligent and efficient use of computer equipment. It often happens that, in the documentation supplied with a computer, it is difficult to find a description of the basic operating principles for an OS and thus we advise those readers who are interested in this subject to turn to the works dealing with operating systems, as cited in the list of recommended literature.

USSR-GDR SEMINAR ON INFORMATION-PROCESSING ALGORITHMS

Tashkent PRAVDA VOSTOKA, 2 Nov 86 p 2

[Unattributed article]

[Text] Valuable recommendations for arranging components compactly in micro-circuits, for increasing the reliability of computer systems, and for a number of other directions of science and technology have resulted from cooperation between mathematicians of the Soviet Union and the German Democratic Republic. A seminar for scientists of the two countries, which was organized in Samarkand by the Computer Center of the USSR Academy of Sciences, was devoted to timely theoretical and applied problems in the field of algorithms for information processing.

"Our productive cooperation has been going on for more than 15 years," stated Professor Gustav Burosch, director of the mathematics institute of Rostock University. "We do not confine ourselves to exchanging information but pursue joint research, combining efforts in key directions of science. We have cal-culated--mathematicians love to calculate everything--that during this time our scientists have worked at Soviet institutes for more than 110 months!", said the professor with a smile. "Specialists from the Soviet Union have done just as much work in our country, too. Results of joint developments in the fields of combinatorial analysis, control-system synthesis, theory of automated equipment and theory of image recognition are finding broad employment in geology, gas production, automated control systems for irrigation works, medical diagnosis and other areas."

The participants in the seminar outlined future directions for joint research.

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PROGRAMMABLE ENVIRONMENT SIMULATOR FOR PLANNING OF AUTOMATED REAL TIME SYSTEMS

[Article by M.N. Bukharov and A.Ya. Oleynikov]

[Abstract] An environment simulator is suggested as a means for design and implementation of automated real-time systems using the SM computer series. A functional and structural model of the environment simulator is presented. The simulator is programmable: adjustment of the system to a specific environment is performed by writing a program which amounts to a model of that environment. The static and dynamic characteristics of the selected environment are included in the input language. The model of the computer system is a set of interacting parallel processes formulated as subroutines without parameters and interacting through common variables.   The environment simulator is a convenient tool for design and implementation of real time systems, particularly systems for automation of expedition radio physical experiments. Implemented under RAFOS on the SM computers, the system utilizes a CAMAK programmable controller. The system is currently being adapted to run on the Elektronika-60 microcomputer, and a K580 version is planned. References 25: Russian.

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UDC 681.3.06

TESTING OF PROGRAMS FOR PARALLEL COMPUTER SYSTEMS WITH COMMON CONTROL

[Article by G.N. Kalyanov]

[Abstract] An attempt is made to distinguish some of the structural properties of data flows in a program and on this basis to suggest some testing strategies oriented toward data flows. The strategies suggested are expansions

of a strategy suggested in a previous work, moving it towards parallel computer systems with common control. Expansion is in the area of the model of the data flows, in which a number of parameters are introduced to describe the composition of the processor elements at each point in the program, resulting in the appearance of additional test paths corresponding to various methods of parallel processing of information objects. The strategies are oriented toward testing of individual program operators and are universal in the sense of applicability to any operator of practically any known higher level programming language; the strategies can be used to test blocks or an entire program; they allow more complete testing of a program than previous strategies based on program control flow analysis. References 3: 2 Russian, 1 Western.

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SOFTWARE TOOLS FOR DEVELOPMENT OF DIALOGUE PROGRAMS

[Article by B. Volozh, M. Kakhro, A. Urvak and A. Shmundak (Tallin)]

[Abstract] The DIMO (dialogue monitor) system developed at the Institute of Cybernetics, Estonian Academy of Sciences, is a tool set for development of interactive application programs. DIMO was developed in order to create a dialogue monitor optimized for dialogue according to specifications prepared by the user, supporting the possibility of formatted interactive exchange of data between the user and an application program. The basic concepts, capabilities and technical characteristics of the DIMO system are presented, with several dialogue sessions illustrated with sample screens. The major components of the system and means provided for preparing and editing dialogue scenarios are described. The DIMO system runs on YeS computers under OS YeS version 6.1. It can work with local and remote YeS 7920 terminals, either independently or in time sharing mode. Facilities are provided to adapt the system to work under the control of remote processing monitors. Figures 7, references 3: Western.

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DESIGN PRINCIPLES OF MACHINE-INDEPENDENT LINKAGE EDITORS AND LOADERS IN MICRO-
COMPUTER CROSS SOFTWARE SYSTEMS

[Article by A.A. Levitskiy and M.M. Muchnik (Kiev)]

[Abstract] Methods are suggested for constructing linkage editors and loaders
to provide machine independence while preserving the traditional functions of
other cross software system components. The requirements for microcomputer
linkage editors and loaders are noted and the structure of the linkage editor
and loader subsystems of programs which form a part of the MAYAK-YeS micro-
computer software design automation system is noted. The structure of object
modules and load modules is outlined. The first version of a machine-indepen-
dent linkage editor was included in the MAYAK-YeS system in 1980. The linkage
editor subsystem and loader were developed in 1981-1982 in the form described
in this article and are used in the cross software generation systems of 4
microcomputers.   Figures 2, references 5: 4 Russian, 1 Western.

ORGANIZATION OF DIALOGUE MODE OF OPERATION OF THE NORMIN INFORMATION SYSTEM
WITH THE OB MULTITERMINAL SYSTEM

[Article by A. I. Kitov, Yu.D. Romanova and G.V. Obidenyy]

[Abstract] The NORMIN information system is a document-data retrieval system
based on the use of normalized natural language as the input, internal and
output language. The requirements for an information retrieval system include
a convenient language for dialogue between the user and the system, a flexible
information search system, and the availability of multiterminal remote
processing facilities. The implementation of these components in the NORMIN
system is discussed. NORMIN is said to be an effective, flexible man-machine
system allowing data retrieval based on natural language requests by a large
number of users working simultaneously. Language is normalized within NORMIN
in three aspects: Limitation of the number of semantic connections and clear
representation of their meaning; definition of simple structures for sentences
and possible versions of equivalent presentations; and representation of the
composition and sense of descriptors used with elimination of synonyms and
homonyms. The universal NORMIN language can be used to compose problem-oriented
subset languages for specific areas and ranges of problems. The NORMIN
information retrieval system runs under OS YeS and was written in PL/1.
Figure 1, references 9: Russian.

THREE PROBLEMS IN DECENTRALIZED FUNCTIONING OF RING ARCHITECTURE MICRO-
PROCESSOR SYSTEMS

[Article by I.Z. Nafikov and R.M. Nuriyev]

[Abstract] Decentralized algorithms are studied for solution of three problems
arising in local area networks and multiprocessor systems of ring structure:
Parallel sorting of a certain data set distributed over the modules of the
system; equalization of subsets of a certain set (in terms of number of
elements), located in various modules of the system; and examination of a
Cartesian product of distributed sets in a certain sequence. A proof is
presented of the correctness of the algorithm suggested, as well as estimates
of their time complexity. The proof is based on study of the behavior of the
boundaries of certain dynamic sets of sequentially located modules, the data
in which satisfy an assigned property selected so that the absence of such
sets means completion of solution of the problem. Figures 3, references 6:
5 Russian, 1 Western.

IMPLEMENTATION OF THE ADA LANGUAGE ON THE BESM-6 COMPUTER

[Article by A. A. Krasilov, V. L. Leytes, Ye. P. Fadeyeva, V. A. Khitrov and
V. P. Chepkasov]

[Abstract] The conceptual basis and primary advantages of utilization of the
ADA programming language are described. The implementation of ADA presented
in this article is based on the utilization of mathematical machines. The
OTRADA programming system including 12 such machines utilizes the concept
of a virtual ADA machine, the processor of which performs the primitives of
the input language. The purpose of development of the OTRADA system was to
create a programming system for the full ADA language for use on the BESM-6
computer, to create or the basis of this programming system indirect systems
for programming built-in computers, and to provide a certain level of machine
independence for the OTRADA system for the purpose of its future transfer to
other computers. Implementation of the ADA language thus involved the
following steps: Preliminary analysis of the concepts of the ADA programming
language; solution of a number of problems arising during implementation of
ADA language facilities, the primary tool used being mathematical machines

formalizing the structured approach to machine independent implementation of the programming system, development and implementation of the mathematical machine programming system, development of a machine-independent programming system called OTRADA, allowing effective tuning of the system to other computers. References 3: 2 Russian, 1 Western.

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APPROACH TO DEVELOPMENT OF MONITORS FOR PROCESS-ORIENTED APPLICATION PROGRAM SETS FOR SMALL COMPUTERS

[Article by N. A. Semenov and Ye. V. Petrov (Kalinin)]

[Abstract] Design is one of the major stages in the development of programming facilities. Defining the methodology of design as a combination of methods and techniques used for successive development of a planned application program set including a monitor which controls the operation of the programs, the authors suggest an approach toward the development of such monitors for the SM-4 computer. The basic methodology used in designing such process-oriented application program sets is modular analysis, in which the process of development of the plan for the programs is decomposed into stages: Definition of the subject area, analysis of the interconnection of the tasks to be performed, analysis of the data structures, formalization of the computational models and synthesis of a portrait of the application program set in the form of graph structures. This approach is implemented in the development of an application program set for parametric system identification and time series analysis methods. The monitors generated for the program sets for performance of these tasks are described. References 11: Russian.

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MODEL OF DISTRIBUTION OF MAIN MEMORY IN TIME SHARING SYSTEMS

[Article by V. I. Romanov, Minsk]

[Abstract] An attempt is made to estimate the swap time required to redistribute main memory in a time sharing system resulting from the functioning of the memory distribution algorithm utilized in the system. A formal model of the memory distribution algorithm is first constructed and some conditions

of functioning of time sharing systems with limited resources are formulated.
The swap-time estimate obtained is independent of the specific memory distri-
bution and processor time sharing algorithms used in the system. References 6:
5 Russian, 1 Western.

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DEADLOCKS IN ASYNCHRONOUS COORDINATED PROCESSES AND THEIR PREVENTION

[Article by V. N. Krinitskiy]

[Abstract] The author's previous works introduced the concepts of external
operand element, critical step, partial process, joint process, critical
fragment, particular, special and general orders in a joint process, under-
standing of all of which is necessary for an understanding of the present
article. This article discusses deadlock situations in parallel asynchronous
processes in which all directly preceding steps are completed and the next step
is not forbidden (coordinated processes). Structural deadlocks in such pro-
cesses are analyzed by describing a network model of a coordinated collective
process and presenting necessary and sufficient conditions for existence of
a structural deadlock. Methods of detecting and preventing deadlocks and stages
during which such methods can be applied are discussed.   The methods of
deadlock analysis and investigation of deadlocks using fragment delay graphs
presented are sufficiently complex that they are not amenable to complete
automation: Human participation is required.   The analysis can be performed
during the programming stage or in debugging and analysis after the initial
versions of programs have been written. Figures 7, references 5: Russian.

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AN EFFECTIVE ALGORITHM FOR OPTIMAL IMPLEMENTATION OF TRANSFER OPERATORS

[Article by V. P. Makarov, Gomel]

[Abstract] Modern computers include a variety of jump or transfer instruc-
tions in addition to the simple direct unconditional jump. One task in
programming is to select jump techniques minimizing machine language program
length. This article discusses optimal implementation of transfer operators
for computers in which the method of transfer depends on the location of the

transfer instruction and the label used. The optimal methods of implementation of transfer operators are sought by the method of successive approximations utilizing as the initial approximation the selection for each transfer operator of the best methods of implementation. In second and subsequent steps the best possible method of implementation is selected for each transfer operation based on the addresses of instructions and labels calculated in the previous step, then addresses of all intructions and labels are recalculated. The process continues until the next step produces no change. This usually requires only two or three steps. This algorithm has been implemented in the SPT SAGET code generator for YeS computers. References 4: Russian.

HEURISTIC PROBLEM SOLVING PRINCIPLES

[Article by O.V. German, Minsk]

[Abstract] The practice of heuristic problem solving has revealed certain strong heuristic principles which tend toward the production of objectively optimal solutions or at least support local optimization. This article introduces several of these principles, then attempts to develop a concept of a systems approach to automation of the heuristic search for solutions. The principles discussed include the principle of limited selection, principle of elimination of the worst versions, maximin or minimax principle, principle of simplification, and the principle of the minimum aftereffect. Assuming that a library of implementations of these heuristic principles is available, the problem arises of automation of the solution of a class of problems by a systems approach. The stages in functioning of a system for automated heuristic search for a problem solution are: Formulation a model of the problem; classification of the model by frame or other semantic constructions; recognition of the problem; selection of a subset of solution techniques; statistical analysis of the results of solutions; selection of the best techniques; and generation of new heuristic rules or criterion if necessary. Figures 7, references 12: 9 Russian, 3 Western.

REPRESENTATION OF ISOLINES AND SECTIONS OF A SURFACE DEFINED BY AN IRREGULAR
SYSTEM OF READINGS

[Article by A. L. Fuks, Tomsk]

[Abstract] The problem of processing and graphic representation of data
obtained by observation of three-dimensional objects such as fields and
surfaces is discussed. Where the values of variables are determined not at
the nodes of a rectangular grid but at irregular points, the variables may
be approximated at the nodes of an arbitrary rectangular grid, or the system
of initial points may be triangulated by construction of piecewise-linear
interpolating surfaces and representation of the isolines by a triangular grid,
although the lines thus produced oscillate more strongly than in the first
method because the node points are computed by linear interpolation. This
oscillation can be eliminated by smoothing the interpolating surface. This .
article presents an algorithm for piecewise-linear interpolation of a surface
and describes computer programs for construction of isolines and cross sections
of the surface avoiding this oscillation. Construction of a surface represen-
tated by 1,000 points requires 400 seconds of YeS-1033 machine time; 2,000
points requires 1,000 seconds. Isolines are automatically labeled as they are
plotted.   Figures 3, references 4:   3 Russian, 1 Western.

ABOUT THE PROBLEM OF INTELLIGENT AUTOMATED PROGRAMMING

[Article by N. A. Krinitskiy]

[Abstract] As an alternative to the "dumb" programming of today, in
"intelligent" programming, a computer would learn the means and methods of
performing tasks not the way they presently do, by simply translating
highly detailed instructions embodied in "dumb" programs, but as people do,
so that the next time the same job needed to be done, the machine would not
simply blindly follow detailed recipes, but would call upon previous exper-
ience at similar tasks to do the job with far less detailed instructions.
The question is whether such "smart" programming is possible. This article
discusses the essence of smart automated programming and demonstrates the
possibility of the technique by examining a hypothetical smart compiler. It
is the job of the smart compiler to convert the unformalized objective know-
ledge of the user to formal knowledge, relieving the programmer of this task.

This makes the smart compiler more than a set of application programs which can be tuned, with a dialogue interface. The unformalized knowledge of the user is utilized to construct a model of the user's knowledge, so that the compiler actually accumulates metaknowledge concerning its user. References 7: Russian.

PROGRAM SUPPORT SYSTEM IN AUTOCODER TYPE LANGUAGE

[Article by G. V. Yermakov and V. L. Katkov, Minsk]

[Abstract] A MIX-machine interpreter has been written for the YeS computers, allowing Donald Knuth's classic work The Art of Computer Programming to be used to train the next generation of Soviet systems programmers. This article praises the book, published in Russian in 1976, and describes MIXAL programming in general terms. References 17: 15 Russian, 2 Western.

TWO APPROACHES TO THE PROBLEM OF DYNAMIC ALLOCATION AND LIBERATION OF MEMORY IN FORTRAN PROGRAMS UNDER OS YeS

[Article by V. K. Glaum, Alma-Ata]

[Abstract] A method of dynamic RAM allocation for Fortran programs is suggested which does not require preliminary reservation of arrays in the calling program. The connecting link between the calling and called Fortran programs is a subroutine called DVPAM2, written in Assembler, which allocates small areas of memory. The subroutine, its calling procedure and parameters are described. A second memory allocation subroutine called DVGETM is also described, allowing dynamic allocation of additional RAM as a program operates. The subroutine DVFREE is also described, allowing dynamic liberation of memory formerly acquired with DVGETM as the program continues to run. References 7: Russian.

FORMAL MODEL OF DIRECTIVE-TYPE DIALOGUE SYSTEM

[Article by O. V. Pavlyuk and V. V. Rossikov, Leningrad]

[Abstract] A formal model is described, oriented toward description of dialogue systems as an object of planning and considering the actions of the user working with the dialogue system. This formal model, based on the concept of the process, describes a directive, request-response dialogue. The system described is capable of generation of macros, sequences of elementary instructions which a user can construct and to which he can attach names, allowing the name of such a sequence to be substituted for entry of the entire sequence of instructions. References 4: Russian.

SYNTACTIC ANALYZER FOR INFORMATION SYSTEMS

[Article by S. I. Rau]

[Abstract] A syntactic analyzer is suggested, oriented toward a class of local languages created by automated information system develpers for input and editing of instructions and data. The simplicity of the ethod of analysis and assignment of syntax and the brevity of the program, just 29 BASIC statements, the fact that it requires no special mathematical knowledge and is not related to the technical specifics of the computer, allow the analyzer to be rapidly studied and included in data input and query programs. The program is presented in its entirety, and implements a descending branching method of syntactical analysis of a string of characters which may come from a terminal or a file or may be the output of another program. Figure 1, references 3: Russian.

GENERATION AND STATISTICAL TESTING OF SEQUENCES OF N-DISTRIBUTED PSEUDORANDOM NUMBERS

[Article by G. V. Dobris, Leningrad]

[Abstract] A class of pseudorandom number generators is studied which produces sequences of uniformly distributed pseudorandom numbers with a high degree of uniformity of n-dimensional distributions. The empirical distributions and random actualization of sequences are statistically studied by the method of rising and falling series. The results of testing of 100 actualizations are presented in tabular form. The probability $P(X^2{}_9 > Z)$ is calculated, where $Z = \sum_{i=1}^{10} [(n_i - 10)^2 / 10]$. The order of uniformity of the multivariate distribution of n is found to be a reliable quality characteristic of generated sequences. The best generators guarantee statistical independence of long sequence sectors, which is practically impossible to achieve with traditional multiplicative random number generators. Figure 1, references 4: 3 Russian, 1 Western.

ALGORITHMIC DATA STRUCTURE ALGEBRAS AND MULTILEVEL PROGRAM PLANNING

[Article by G. Ye. Tseytlin, Kiev]

[Abstract] This article is dedicated to the construction of algorithmic data structure algebras, based on the apparatus of modified systems of algorithmic algebras oriented toward formalization of structured parallel algorithms and program systems. An interpretation is presented of the basic concepts

of the apparatus, including an abstract multiprocessor model, information set, modified algorithmic algebra system operations, and parallel regular system, in order to formalize data structures oriented toward sequential and parallel processing. The concept of the abstract data type is refined on the basis of the algebraic apparatus developed, the formalism of structural planning grammar is enriched. The advantage of the formalism suggested in this article is that it is extendible to algorithmic data structure algebras of the apparatus of formal transforms developed within the framework of the theory of algorithmic algebra systems. References 10: 9 Russian, 1 Western.

LINGUISTIC FACILITIES FOR PROGRAMMING 'ASYNCHRONOUS' GROUPS OF PROGRAMS

[Article by V. N. Krinitskiy]

[Abstract] A previous article introduced the concept of the group of algorithms as a system of algorithms which process a common operand in coordination with each other. The steps in the algorithmic processes may be regular, in which the algorithms access internal operand elements, or critical, in which they access external operand elements. This article discusses the information necessary to coordinte this combined processing and suggests one version of linguistic facilities suitable for the purpose. References 3: Russian.

CLASSIFICATION SYSTEMS AND DOCUMENTS

1. DATABASE ORGANIZATION AND MANAGEMENT OF AUTOMATED MANAGEMENT SYSTEMS. GENERAL ASPECTS OF CLASSIFICATION SYSTEMS, CODING AND UNIFIED DECIMAL SYSTEMS

UDC 311.214:025.4:681.3

ORGANIZATION OF DATA CHECKING AND ASSURANCE OF DATA RELIABILITY IN CENTRALIZED COMPUTER INFORMATION PROCESSING

[Article by candidate of economic sciences A. A. Ilyukovich and S. P. Belyy of the Belorussian Branch of the VNIPIuchet, USSR Central Statistics Administration]

[Text] The software and hardware of modern computers can provide absolute reliability of data transformations in the course of their processing and, hence, the correctness of the obtained results depends entirely on the reliability of the initial information. Therefore, one of the vital questions in the processing of economic information and records by computer is the checking and assurance of reliability of the entered data. The principal method of entering data into the memory of a computer in the case of centralized computer processing of information is reading from primary sources with an input device. Depending on the specific applications, the input procedure may be done by various techniques and is broken down into the following stages:

preparation of the documents for transfer to the computer storage media;

recording of the information on the primary storage media in data preparation devices;

computer input and data checking;

data correction;

arrangement of data for subsequent processing.

The stage of preparation of documentation for transfer to machine media involves:

selection of like documents and grouping of these into packs;

coding of the data;

implementation of measures to assure data reliability.

A pack assembles documents with total number of lines usually not in excess of 100. Each pack of bound documents is provided with a label. The label indicates the number of the pack, the data preparation model, the number of documents in the pack, and so on.

In many cases, the information of documents requires preliminary coding. The coding process is laborious and a source of additional errors; therefore, wherever possible, it should be avoided. Experience recommends the use of generally acknowledged mnemonic abbreviations contained in the documents (e.g., measurement units), instead of their codes. For this, it is sufficient to create a directory with various abbreviation alternatives.

One of the most popular methods of assuring data reliability is the use of various check sums (KS) in the entered document packs. The KS already present in the documents or new ones produced while preparing the information for the machine storage media can be used. When entering the data, mistakes in the numerical or code items are not permitted. Thus, it is desirable to take the sums of the code items as well. When using KS of documents, the most practicable check sum method is adding by graphs (columns) of the documents. There can be several ranks of check sum (per document or pack). The check sum of a higher rank is the sum of the lower-rank included KS. It is quite effective to use an increasing-total KS. An increasing-total check sum is the cumulative sum for all documents from the beginning of the pack. The shortcoming of this method is the ineffective use of the KS already present in the documents, while its advantage is the consistency of production of the KS and the possibility of using them in any given field of a document. With this method, the optimal number of lines after which a KS should be done can be found by trial and error.

In many cases, it is possible to dispense with the KS for all of the graphs (columns) of the documents and use the sum of these, i.e., the sum of all numerical items of the document.

Entering of information on primary storage media is done with perforated tape, punched card, magnetic tape and other data preparation devices. The information of the documents is put on the primary media line by line. Each line usually has its own identifier, specifying its type. The lines are entered in a fixed or flexible format.

The fixed format is characterized by a definite position for each item relative to the beginning of the line. In this format, each item in lines of identical type has a constant length in characters (bytes), numerical items being pushed toward the righthand margin of the graph, alphabetic items to

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the left. With a fixed format, there is no need for dividers or line beginning (end) markers. Lines of the same type have a constant length.

For preparation of information in flexible format, line beginning markers, dividers and other auxiliaries are introduced. Lines of the same type generally have different length, while the meaning of an item is defined by its number in the line or the number of dividers preceding it in the line. The flexible format is used in preparation of data on perforated tape.

In modern magnetic tape data preparation devices, blocks of constant length of 80 or 160 bytes are set aside for any given type of line in any given format. The blocks include the information of the lines, followed by fillers (gaps). In the majority of cases, a flexible data format is used.

In the general case, documents consist of lines of different type. Any given document may be represented as a "tree" with a root or document header line, including items common to the lines of the document. After the header line come the subordinate lines which, in turn, may have subordinate lines, and so forth. In a pack of documents, the main line is the label line, after which comes the header line, the type line for the first rank of subordination, that of the second rank, and so on.

The standard procedure for data entry into the computer memory should include a copying on external storage medium. The result of the copying is the working, or auxiliary data sets. During the entry process, markers for detected errors may be put in the working sets, resulting from a check of the data against their descriptions. The available data entry systems of the input/ output generator type (GVV), the VKI-4 in the Unified System Computers and the SPO-BAZA-VVOD for the SM computers, perform a check against previously compiled and processed data descriptions. This determines whether the lines are correct in respect of number and nature of the items, whether the values of the items lie within their range, and so on.

All the types of check provided by the system may prove insufficient. The user customarily develops supplementary check programs, the end result of which are protocols indicating the detected errors. The supplementary check programs may analyze the correctness of the KS, the existence of codes in the directories, the correctness of the computations, the correctness of codes with a security module, the completeness of the data, the data logic, and so on. Each such program should have its own check protocol. The multitude of protocols resulting from the entry and checking process, which describe the data from various aspects, are inconvenient for analysis and use.

A single check protocol indicating all the errors is much more effective for analysis. Often it is not possible to produce a single protocol in one program module, and therefore the result of the system data check and the result of the supplementary logic check must be combined by the resources of the user. The following programming methods are recommended for effective production of a single protocol.

The checking for existence of codes in the directories can be simplified in connection with the small size of the directories and their orderly arrangement in the main computer memory. The method of a dichotomy directory retrieval circumvents the need for preliminary sorting of the initial data.

Codes of modest size (up to 5 bytes) can be assigned a corresponding region in the main memory, noting here the existence of the code in the directory under a number equal to its absolute magnitude. In this case, checking for the existence of a code among the data in the directory comes down to a retrieval by direct addressing in the aforesaid region.

If, for whatever reason, it is not possible to perform an effective retrieval without preliminary data sorting, the inspected codes should be extracted from the data and together with the numbers of lines in which they appear be formed into a file, which is then arranged in order of the codes. After checking against the directory, only the codes present in (or missing from) the directory may be left in this file. An arrangement in terms of the initial numbers of the lines places this information in a form convenient for production of a single protocol.

This same procedure of extracting only the information necessary to a check can also be used for complex logic inspection.

The checking for correctness of computations, correctness of codes with respect to a security module, completeness or correctness of the KS presents no difficulties for production of a single check protocol.

In accordance with the obtained protocol, using the numbers of the lines in the working data set, it is possible to substitute lines in this set, insert omitted data, and remove duplicated or superfluous lines.

After correction, another data check is performed and the check protocol put out. The protocol should be put out within the range of the specified packs.

In the subsequent data processing, the input systems present the user with information arranged according to the descriptions of the output data sets.

The correction of arranged stored data sets, in particular directories, has certain peculiarities. In this case, the correction is entered in the identical form as the original data and is checked by the identical programs. After placing the correction in sequence, the correction program should carry out a removal from the directory, a substitution in it, or an insertion of new codes.

The conventional correction for a removal is a line in which all the values of nonkey numerical items are designated by zero and alphabetical items by a gap. In the cac of an insertion, all the items are filled in. For a substitution, only the items being substituted, the other being prepared as a zero or a gap.

In substituting zero for the value of an item, the value (character) conventionally taken as the marker of this function should be used.

This system for organization of the checking and assurance of reliability of entered information makes use of the experience of the computer centers of the USSR Central Statistics Administration in the handling of problems involving processing of large data files.

The described principles of construction of a data entry procedure have been implemented in the SM-1600 in the application program package for integrated automation of bookkeeping and accounting for the centralized accounting offices of the State Budget agencies.

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SELECTION OF A METHOD OF ENCODING THE DATA ACCESS KEYS IN AUTOMATED MANAGE-
MENT SYSTEMS

[Article by candidate of technical sciences L. P. Akimov of the VNIKI
Minvneshtorga]

[Text] The data in automated management systems (ASU) are stored in databases
in the form of records. Each record corresponds to a copy of the object [1]
in which the data are stored.

A record consists of fields describing the attributes or items of an object
[2]. The identifier of a record is the access key for this record: the first
key uniquely determines each record, the second key the subset of records per-
taining to a single object.

In the ASU of large organizations and sectors where information on a multitude
of processes is kept in the database, it becomes necessary to simultaneously
access the data of a particular set of objects, each of which has its own key
[1], i.e., it becomes necessary to access data with a massive first key, the
entering of which may result in mistakes and cost additional time.

If the data items of an object are treated as a collection of attribute-items
and base-items [2], the data access key may be virtually any given combination
of attribute-items of the object. The data of a mutually interrelated set of
objects describe a particular process and should be accessible for simultaneous
updating, so that from the user's standpoint they constitute an indivisible
collection of qualities of the process.

The use by ASU of computergrams of a process [3], which are a computer-prepared
document containing current data of the process and at the same time being a
document from which data are entered for database management, leads to the
necessity of using special access keys which are not a collection of
attribute-items, but which allow a unique identification of the full set of
keys pertaining to the given process.

In order to minimize the access time and reduce the number of errors during
access, the most simple method of coding a compound access key is the posi-
tional number method. However, this method is suitable for use with nondocu-

ment data access equipment (video terminals, data transmission systems or magnetic storage media).

When the ASU uses computergrams of the process (MP), from which the data entry is performed, a more rational method is the sequential arrangement or, more accurately, the object-ordering method, whereby an access key consists of two parts:

an identifier of the objects possessing common attributes;

a serial number within the confines of the volume of data of each object, identified in the first part of the key.

This method does not provide a large advantage over the serial number method when data is being transferred from the MP by key to printed entry forms, as the length of the key in this case may be many bits.

The object-ordering method provides significant advantages when the MP is used directly for database management (correction of existing data and entry of new data).

In this case, the first part of the key is located in the heading of the MP, so that this part can be entered only once for the entire document page, while the second part is located immediately in front of the lines of the document from which data is to be entered. During the entry, the first part of the key is automatically linked to the second part.

At present, a number of ASU are employing an object-ordering method where the first part of the key is the page number, the second the line number. However, this coding has a number of drawbacks. The page number usually does not coincide with the page number of the document itself, but is a certain conventional number requiring clarification for the user. A coordination with the actual pages of the document is difficult, since the entry of new lines in the document, and the removal of old unnecessary data, would require a renumbering of the pages in the key, which makes it impossible to access data from previously produced documents. The line number, again, is not the serial number of the line on the document page, owing to insertions and deletions of data, and this would result in discrepancies with the previously produced documents in event of a renumbering of the lines, as shown above. Violating the order of line numbers causes the users difficulty, especially as the document page also prints lines with no numbers (control lines, totals, etc.). Usually, the display page number is further tied to one of the attribute-items, which is the main item used in analysis of the document. For example, in the analysis of a document of a group of enterprises in cross section, the display pages should be correlated with each enterprise.

These shortcomings do not apply to the coding method where the first part of the key uses an identifier of the object, or source (consumer) of the data for the base, while the second part uses a serial number of arrival of the data at the base from this source, or a serial number of the preparation of

the data for this consumer, hereafter known as the positional number. The convenience of this method consists in the fact that the identifier of the object entered in the document heading in MP to be used for a profile printout of the particular object lets us introduce a single number for identification of the object (which is important in the event of entering new records from the MP) and for formation of the key of all data of the document page. Each line of the document has a positional number (second part of the key), in no way connected to the numeration of the lines of the document page.

In the computergram of a process where data required are not found in the profile of the object identifier which is the first part of the key, the entire key is printed for each document line, which also lets the user determine the source or consumer of the information.

In order to operate such key classification system, the computer stores a table of the last occupied numbers for each identifier of the first part of the key. Each incoming record or output record being formed for an object automatically receives the next number in the table in the computer, with updating of the table by the program.

Since the serial number portion of the key should enable an enumeration of the maximum number of records of an object, in order to cut down on the length of the key it is advisable to update the table by resetting to zero, given the lifetime of the data.

It is occasionally good to have one or two reserve bits in the serial number section of the key. These, in the first place, provide the opportunity for a processing without increasing the quantity of data; secondly, they can be used for various special situations. For example, when it is required to enter data into the base without consulting the table of the last occupied numbers, these data are assigned a key with any given occupied key, but having a nonzero numeration in the reserve bits. Moreover, by using the data key, it is possible to enter new data from a document with a reference to this key, but without introducing a lot of attribute-items of the new data. For this, a special note is made in the reserve bits of the key. For the new data, the program selects determining attribute-items from the data to which the key refers. This reduces the input volume and, thus, the number of errors and the time of data preparation.

The described method is being used in the automated system for machinery and equipment export plan computations at the Ministry of Foreign Trade. The first access key to the plan data is 32 bytes long, being distributed as follows: code of the ministry-supplier (4), code of the commodity (10), code of the funds distributor (4), code of the marketing organization (4), code of the association (3), code of the factory (4), code of the measurement unit (3 bytes).

The principal source of the data are the associations, and therefore the special key has the following form: code of the association (3), positional number (4), reserve (1 byte).

The positional number has a considerable reserve in respect of data volume. Using such key has enabled a fivefold reduction in the data access time and the number of data entry mistakes.

BIBLIOGRAPHY

1.   Martin, Dzh., "Planirovaniye razvitiya avtomatizirovannykh sistem" [Planning the Development of Automated Systems], Financy i statistika, M., 1984.

2.   Kokorev, V. I., "Sovershenstvovaniye form dokumentov ASU" [Modernization of the Formats of ASU Documents], Nauka, M., 1983.

3.   Akimov, L. P., "Use of the Principle of a Unified Document in Automated Organizational Management Systems", KLASSIFIKATORY I DOKUMENTY, No 8, 1986.

2. DEVELOPMENT AND INTRODUCTION OF CLASSIFICATION SYSTEMS AND UNIFIED DECIMAL SYSTEMS

PRACTICAL EXPERIENCE FROM THE INTRODUCTION OF THE UNIFIED SYSTEM OF DESIGN DOCUMENTATION CLASSIFICATION SYSTEM IN THE COAL INDUSTRY

[Article by candidate of economic sciences K. V. Lotsmanov and L. A. Pyatunina of the VNIIUugol]

[Text] The necessity of adopting the classification system of the Unified System of Design Documentation (YeSKD) in the coal industry is dictated by the fact that this multiple sector organization includes coal machinery design and mine automation as one of the lines of its operation.

The procedure for introduction and management of the YeSKD classification system is stipulated by the sector procedural instructions "Regulations for the Introduction and Management of a Classification System of Articles and Design Documents for Machine and Instrument Construction in the USSR Coal Industry."

The executive organization in the sector for introduction and management of the YeSKD classification system--the VNIIUugol--has created two permanent work groups for introduction of a unified objectified classification system for designation of articles and design documents (hereafter, the system). One of these includes representatives of the leading enterprises and organizations in coal machine construction, mine automation and mine rescue; the other includes representatives of the leading institutes in mine layout and planning (collieries, strippings, dressing factories). A number of design organizations of the All-Union Association Soyuzshakhtoproyekt have been involved in a trial adoption of the YeSKD classification system. The findings will help in accelerating the adoption of the system by the association.

The organizations and enterprises of coal machine design and mining automation are directly involved in a trial coding of articles with the YeSKD classification system. The enterprises and organizations send annual reports to the VNIIUugol regarding the course of the work in adoption of the system.

In order to modernize the organization of the implementation of measures, instructional letters have been developed and various forms of training of the specialists in use of the YeSKD classification system and the organization of its management have been carried out. For example, around 250 members of the design bureaus and standardization offices have received training at the institute for advanced qualification of the USSR Ministry of the Coal Industry. For on-the-job training, a program has been worked out and illustrated learning aids published.

Given the specific nature of the design work of the design organizations of the VO Soyuzshakhtoproyekt, which prepare documentation for construction and reconstruction of the enterprises in the volume stipulated by the SPDS and YeSKD standards, a document has been developed: "List of Articles to be Designated by an Objectified System at the Design Organizations of the VO Soyuzshakhtoproyekt."

In order to facilitate the identification of classification features in the YeSKD system and upgrade the level of unification of the VO Soyuzugliyeavtomatika, an illustrated "Parts Title Designator" has been developed for the categories of parts in the sector, such as are characteristic of the mining automation articles. The designator covers the parts which are most common in the mining automation articles, being distributed among categories 71-76 of the YeSKD classification system. There is an alphabetic subject index for each category. The designator does not duplicate the parts in the All-Union "Parts Title Designator."

In 1986, the "Assembly Units Title Designator" will be developed, including the titles, codes, definitions and typical composition of the standard assembly units used in mining automation articles.

The designator will describe the assembly unit in strict conformity with the unfolding of its attributes during each stage of the classification.

The VNIIUugol will exercise administrative supervision over implementation of the measures to introduce GOST 2.201-80 and the YeSKD classification system at the enterprises and organizations of the sector. Inspections have revealed that the facilities for handling the YeSKD classification system have not been created in all places, nor has the instruction in transition to the objectified designation system been completed. The activity of the executive organization in rendering methodological support and providing the required materials and categories of the classification system is currently being reviewed.

The inspection documents contain the conclusions of the commission and make proposals to correct the shortcomings and offer assistance to the higher authorities.

The introduction of the YeSKD classification system and the objectified system for designation of articles and design documentation, in turn, requires introduction of the fifth group of all state standards of the YeSKD (GOST 2.501-68).

Currently there are around 100 design organizations operating in the coal industry, involved not only in creating coal machinery and mining automation articles, but also participating in the layout and planning of the mining enterprises. The volume of design and planning is constantly on the rise in the sector. Hence, the unification of the parts and units of both newly developed articles and those in mass production is an urgent concern. Another pressing problem is the continued modernization of the organization of the design process, the assimilation of new products, and the management of production.

The objectified classification system for designation of products and design documents, being introduced as of 1987, offers the possibility of creating a unitary information base for effective solving of the aforesaid problems. This will require, first of all, a solving of the problems of systematization of technical-economic information and its subsequent utilization in planning and production. With the introduction of GOST 2.201-80, other problems involving minimization of the expense of introduction and operation of the system will also be resolved.

An effective solving of these problems is only possible with extensive use of economic-mathematical methods and computer technology. The capabilities of the computer centers in operation in the sector will allow a practical realization of the stated goals on the basis of a rational grouping of the enterprises and organizations using the computer centers on a collective footing.

The initiation of GOST 2.201-80 cannot be viewed apart from the other problems of the economic operations of the enterprises, which have a direct bearing on the course of the design, planning and production of the articles. This circumstance necessitated a solving of the incidental problems in a systematic way. The preliminary scientific analysis revealed that such system could be an automated design engineering information system, the functions and makeup of which satisfy the needs of the potential users.

[Text]   In February 1985 at the 23rd session of the U.N. Statistics Commission
the third revised version of the U.N. Standard International Commodity Classi-
fication (SMTK) was approved.   In May 1986, this was prepared for printing by
the U.N. Statistics Department.

The goal of the SMTK is to upgrade the quality of foreign trade record keeping
and statistics, as well as the comparability of the foreign trade indexes of
the various countries. This commodity classification of the U.N. was first
published in 1951; in 1961, the first revised version was issued, and in 1975
the second revised version.   These versions were coordinated with another
international foreign trade system, developed in the framework of the Council
of Customs Cooperation--the Brussels Customs Nomenclature, which is currently
known as the nomenclature of the Council of Customs Cooperation (NSTS).

The classification groupings of both classifications (the NSTS and the second
revised version of the SMTK) do not fully meet the needs of the users.   In
addition, due to the deepening of the international division of labor and the
development of automatic processing of statistical information, the time has
come for a coordination of the classifications used in the different branches
of economic activity. Therefore, as of 1973, the Council of Customs Coopera-
tion has been working strenuously to create a multipurpose international
commodity classification--the Harmonized System Nomenclature (NGS), intended
for use in the sphere of production, transportation, customs inspection and
statistics of foreign trade.

The work has been carried on in close contact with the U.N. Statistics
Department. Toward this end, the 21st session of the U.N. Statistics Commis-
sion adopted a resolution to create a third revised version of the SMTK.

The following conditions had to be covered by the new version of the SMTK:

preserve the fundamental principles of construction of the classification
scheme of the second revised version of the SMTK;

allow for structural shifts and changes in the geographical distribution and nomenclature of international trade;

assure compatibility of the SMTK with the economic classifications of the U.N. and the Council of Customs Cooperation used in industry, transportation, and foreign trade statistics.

The SMTK classification pertains to all commodities of international trade. In accordance with the recommendation of the U.N. Statistics Commission, the foreign trade turnover of a country includes the commodities which increase or decrease its material resources. Thus, in addition to the commodities exported or imported on a commercial basis, the SMTK covers goods delivered as foreign aid, concessions, military reparations, military equipment, and postal deliveries.

The third revised version of the SMTK has five classification levels: divisions, groups, subgroups, commerce items and subitems. The following attributes are used to form the classification groupings:

raw material (from which goods are produced);

process technology (the degree of processing of the goods);

the destination of the goods;

the significance of the goods in international commerce.

Each division uses its own sequence of attributes. The order of arrangement of the consolidated classification groupings in the recent version of the SMTK does not differ from the previous edition. First come the foodstuffs, including flavoring substances, then the nonfood raw materials, fuel and finished industrial goods, divided into chemicals, machinery, equipment and transportation vehicles. The order of arrangement of the major groupings in the SMTK coincides with the conventional arrangement in the sector classifications of the capitalist countries. The scheme of the SMTK does not allow a distribution of goods into production facilities and objects of consumption, nor primary and circulating assets. At the same time, this classification enables a division of commodities into three classes:

raw material (for production of foodstuffs; of vegetable and animal nature, other than foodstuffs);

semifinished articles (food; other semifinished goods);

finished articles (food products; transportation vehicles and equipment; other goods).

In the third revised version of the SMTK, the classification groupings are more detailed than the previous edition. A sizable number of groups, subgroups, commercial items and subitems have been introduced (cf. table).

Comparison of the Structure of the Second and Third
Revised Editions of the United Nations SMTK

Title of Division	Groups		Subgroups		Commercial Items		Commercial Subitems	
	2nd	3rd	2nd	3rd	2nd	3rd	2nd	3rd
Foodstuffs and live animals	10	10	34	36	94	132	134	344
Alcoholic beverages and tobacco	2	2	4	4	11	11	12	22
Nonfood raw materials, except fuel	9	9	33	36	105	123	143	267
Mineral fuel, lubricants and similar substances	4	4	7	11	30	25	27	37
Fats, oils and waxes of vegetable and animal origin	3	3	4	4	18	21	16	44
Chemicals	9	9	25	33	95	126	270	474
Processed items, preferably classified by substance	9	9	53	52	190	233	458	829
Machines, equipment and vehicles	9	9	45	50	159	214	238	653
Various finished goods	8	8	28	31	88	144	266	442
Goods and transactions not included in other divisions	-	4	-	4	6	4	9	6
Total	63	67	233	261	796	1033	1573	3118

The recent version of the SMTK has a large number of newly created commodity groups, arranged in the last stage of the classification and formed from various groupings of the previous version. As a result, only 24 percent of the commodity subitems of the third revised version of the SMTK are identical in content with the groupings of the second version. Furthermore, the individual commodity groups, items and subitems have been rearranged in the recent edition. Thus, military equipment and munitions are moved from division 9, "Goods and transactions not included in other divisions", to division 8, "Various finished goods." These changes produce a divergence in the foreign trade data compiled according to the different SMTK versions.

In order to facilitate the goal of comparability of data, transitional keys at the 5-figure level have been developed from the second to the third and from the third to the second version of the SMTK.

The third revised version contains:

a list of classification groupings arranged in ascending order of codes;

the NSTS and NGS codes corresponding to the codes of commodity items or sub-items of the SMTK;

the codes of the second revised SMTK version;

two supplements, giving the transitional keys from the second to the third revised SMTK version and from the NSTS to the most recent SMTK version.

The commodity subitems of the third revised SMTK version are identical not only in content, but also in title to the corresponding groupings of the NSTS and NGS, so that comparability can be achieved between the recent version of the U.N. foreign trade classification and the foreign trade classifications of the Council of Customs Cooperation. Thus, an international system has been offered to the countries, suitable for both customs purposes and economic-statistical analysis.

The recent version of the SMTK is comparable to other economic classifications: the U.N. Classification of Major Economic Groupings, the U.N. Standard Sector Classification, the U.N. Maritime Transportation Nomenclature, the General Product Classification, developed together with the EEC Statistics Office and the U.N. Statistics Department.

The SMTK adopts a decimal numeric coding system. The structure of the five-place SMTK code includes the codes of the division, group, subgroup, commodity item and commodity subitem (one bit each).

The SMTK entails the possibility of further expansion, for which purpose there is a large reserve within the divisions, i.e., at all levels of the classification, beginning with the second place. Thus, on the second level, the utilized capacity of the classification system is 67 percent, while on the last level it is 3.1 percent. It is very important for commodity classifications to provide a sufficient reserve, since the industrial production and along with this the commodities put on the foreign and domestic markets are being replaced with unprecedented speed in the modern scientific-technical revolution.

The SMTK is widely used in routine international commerce. The majority of the international organizations employ it as the foundation for compiling statistical data on world trade. Many of the countries in the capitalist sphere, as well as Yugoslavia, have adopted it as the basis for their national foreign trade classifications. Furthermore, the United States and a number of Latin American countries use the SMTK as the foundation for their customs nomenclature.

The U.N. Statistics Department has been issuing regular annual statistical surveys of the foreign trade of the U.N. member nations since 1960, in

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accordance with the first revised version of the SMTK; foreign trade data since 1976 in accordance with the second revised version; while data for 1988 and subsequent years are to be published in accordance with the recent version of the SMTK in the U.N. publications: International Trade Statistics Yearbook, World Trade Annual, Monthly Bulletin of Statistics, and Commodity Trade Statistics.

BIBLIOGRAPHY

Standard International Trade Classification Revision 3, U.N., N.Y., 1986.

3. MANAGEMENT OF CLASSIFICATION SYSTEMS AND UNIFIED DECIMAL SYSTEMS

FACILITIES FOR MANAGING THE DATABASE OF UNIFIED DOCUMENTS OF THE SECOND STAGE AUTOMATED SYSTEM FOR PLANNING CALCULATIONS

[Article by N. K. Golubev of the Main Computer Center of the USSR Gosplan]

[Text] The goal of the second stage of the USSR Gosplan's automated control system for planning calculations (ASPR), under development, is to support the composition of draft plans and the optimization of planning decisions by creating mutually interdependent complexes of planning calculations, i.e., the distinguishing feature of the ASPR second stage is the transition from automation of local problems to the creation of complexes aimed at solving the most critical problems of economic planning. This problem requires a maintenance and further elaboration of the database, software, hardware and other facilities underlying the solving and mutual interdependency of all the ASPR component tasks.

One of the chief tasks expected of the database organization and management of the second stage ASPR was the creation, introduction and effective utilization of facilities for management and operation of a centralized database.

The centralized database is the fundamental unit of the ASPR database organization and management subsystem, being designed to store the service and directory information and the standardized documents utilized in the process of development of government plans and supervision of their implementation.

Among the facilities used to manage and organize the database of standardized documents, which is one of the basic components of the centralized database, there have been developed and approved in the second stage the system SPD-OKA, which is a complex of programs providing centralized input, storage, maintenance, updating and sampling of information, as well as programs for transformation and logical supervision of the standardized documents kept in the database.

The SPD-OKA system is controlled by the system administrators, who are responsible for the status of information in the centralized base and a steady, uninterrupted operation of same. The administrators load the information prepared for massive input, handle user requests, restore data in event of a soft failure, and carry out the full range of standard operations directed at organizing a reliable system operation.

The SPD-OKA system carries out the following types of work with standardized documents:

centralized preparation of the initial data on magnetic tape by means of the SPD-9000 data preparation system;

inspection of the initial information in accordance with the formal data description, specified by a list of parameters of standardized form;

computer input of data stored on magnetic tape in the customary input format of the SPD-OKA system;

storage of the entered information on standardized documents in the databases maintained by the SUBD OKA;

actualization of data;

retrieval and printout of data;

extraction of information from the databases in terms of indicated items of the standardized documents;

sampling and swapping of information from the base of standardized forms for use in computer-run calculations;

off-loading onto magnetic storage medium in the volume of a separate form and composition of standardized forms or a group of standardized documents in the format of the DOKUMENT system for calculations in computers of the unified series or the minicomputers ISKRA-226;

swapping of information from the databases of the standardized documents into a virtual user computer in a prearranged form or by individual documents;

direct access to data from the user programs when using the language BETA or the facilities of the language interface of the SPD-OKA system as the means of data manipulation.

The SPD-OKA system offers facilities for work involving construction and functional organization of the database of standardized documents:

creation of control blocks of the data description language for the databases;

creation of databases of standardized documents and a directory database;

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input, extraction and alteration of descriptions of the standardized forms entering into the database of the standardized documents.

The SPD-OKA system provides the system administrator with facilities assuring a steady and uninterrupted functioning of the system:

procedures for copying and restoration of databases;

procedures for reorganization of databases;

procedures for testing databases of standardized form;

procedures involved with the system log of the SUBD: initialization of the log, compulsory closing of the log in event of emergency work shutdown, sampling of information from the system logs during database restoration, consolidation of system logs.

The software of the SPD-OKA system provides the administrator with utility options in working with the database of standardized documents:

scrolling from the administrator's control terminal and printout of information from the control (directory) base of the SPD-OKA system;

printout of information from the databases of the standardized documents in a prearranged form, a specific document, or a group of documents of indicated form, printout of lists of parameters of the standardized forms;

scrolling from the system administrator's control terminal and printout of information pertaining to the operation of the system: statistics as to the operating time of the system, information about the magnetic disks containing the data files of the SPD-OKA system, report on the restoration of the system's databases.

The SPD-OKA system has been operating for a number of years at the Main Computer Center of the USSR Gosplan and several other organizations. Its time performance meets the demands of efficient entering of large volumes of data in a mass loading procedure.

The SPD-OKA system can be installed in computers of the series RYaD, having no less than 512 kbytes of main memory. It works under the control of the version 4.0 or higher operating system and relies on the software of the SUBD OKA.

The use of the SUBD [database management system] in the organization and handling of information has substantial advantages over a file organization:

simultaneous operation of several programs in batch mode and remote processing mode;

application programs independent of the physical organization of the data;

improved time performance as compared to a file organization, due to selection
of the access method best suiting the conditions of handling the information,
and specification of the parameters of the OKA system on the level of the
data description block;

direct access to data from user programs through the data manipulation language;

system reliability and data integrity;

option of using the individual basic system services of the SUBD for different
applications, as well as integration, i.e., combined use of the common data
for different applications;

option of remote processing to organize a system with larger volume of pro-
cessed information and brief waiting time.

The selection of the OKA system as the SUBD was dictated by the fact that a
standardized document can be represented as a hierarchical structure on a
logical basis.

The SPD-OKA system operates in one of two modes: batch or remote processing.
The operating mode of the system is determined by the operating mode of the
SUBD OKA. In the remote processing mode, a program is run as an application
program in the message batch processing division.

The SPD-OKA system has been designed such that, along with its ease of
handling, it also has the option of expanding the available functions, letting
the administrator flexibly control the database management. This is an open
type system, where the upper level control module contains the system organi-
zation logic and controls the callup of programs supporting the available
types of operation. The SPD-OKA gains an exceptional degree of modularity,
both in respect of functions and system operating logic. Operating integrity
and dependability are achieved by the fact that the upper level control
module is present in the system as an assignment-station task, and as the
individual kinds of work are performed there are subtasks which are created,
and if a failure or error occurs only a single subtask is shut down.

Data integrity and intactness are assured by the system log kept by the SUBD
OKA.

The majority of the SUBD utilities have been used in developing the procedures
for data file support and restoration.

The contents of the standardized document database are kept in the databases
located in direct access storage media. The number of storage media depends
on the volume of the database.

There are two types of database in the SPD-OKA system:

control bases (the directory base and the detained document base);

databases of the standardized documents.

The information needed for general organization of the SPD-OKA system is kept in the directory base.

The information of the standardized documents, constituting the main portion of the database collection, is located in the databases of the standardized documents.

The principal function of the SPD-OKA system is to provide mass computer entry of user data prepared by means of the data preparation systems SPD-9000, SPD-9000M, YeS-9002, YeS-9003 or some other method in the customary data input formats of the SPD-OKA system, with preliminary check for compliance with the description given by the list of parameters. Data from documents submitted for processing by the SPD-OKA system and not containing errors are entered into the databases of the standardized forms.

Data from documents containing errors are sent to the detained document base. The existence of this base provides the option of not repeating the preparation of documents which contain errors. All that need be done is to correct the individual erroneous strings or elements. Once all the errors are corrected, the document is automatically sent to the database of standardized documents.

The standardized documents are put in the various databases. The name of the database where a document is to be kept is determined during the stage of entering the list of parameters into the SPD-OKA system, previous to the initial loading of the given document.

The databases are laid out such that the SPD-OKA system can process any given document data of different formats.

The SPD-OKA system automatically determines in which database the documents are to be loaded during the information entry operation. The incoming information stream may contain an arbitrary number of forms, and the sequence of header codes and document line codes need not be ordered. The programs of the SPD-OKA system which load the information or select it from the databases perform an automatic adjustment to the required database and required segment. During a session, several magnetic tapes with different density can be processed at the same time, and each tape may contain information in any of the conventional input data formats of SPD-OKA. Data of identical form need not be entered in a single data file.

The result of the information entry session is put out as a Data Transmission Report, listing in full all the operations done by the system on each document.

The mass information entry session is conducted by the system administrators.

The information entered into the databases of the standardized forms becomes available to application programs in the read mode, and also to the programs

of the SPD-OKA system and the operating document correction program in inter-active mode from the YeS-7920 terminal.

When using a network of computers linked by communications channels in the virtual computer working environment, a user registered in the SPD-OKA system and having the appropriate authority is able to swap information from a standardized document database in a document form or group of documents authorized for the particular user to his virtual computer.

After formulating his assignment, the user receives a protocol of the processing of the request and the swapped documents in his virtual computer.

The developed facilities for the unified documentation database management of the second stage ASPR have enabled a significant improvement in the technology of processing of economic planning information and a shortening of the stages of preparation, entry, and inspection of information arriving from the ministries and offices.

SEVERAL ASPECTS IN THE MANAGEMENT OF THE ALL-UNION CLASSIFICATION SYSTEM OF TECHNICAL-ECONOMIC AND SOCIAL INDEXES

[Article by candidate of technical sciences V. Ye. Gumenyuk, N. A. Golubtsova, and candidate of economic sciences E. A. Yarnykh of the NII TsSU SSSR]

[Text] A special place among the all-union classification systems for technical-economic information (OK TEI) is held by the All-Union Classification System for Technical-Economic and Social Indexes (OKTESP). This provides a mutually interdependent use of the other classification systems for a consistent formalized description of the structure and a systematization of the indexes and groupings thereof, a unified nomenclature, and a coordination among subject-based index coding systems.

The OKTESP is a rather capacious (more than 30,000 objects) and complicated classification system, consisting of divisions of several hierarchical levels, mutually interdependent in terms of information. The OKTESP includes:

a rubricator or general classification scheme of the indexes (first level);

a systematic directory of the types of indexes or directory of the mask-positions arranged in accordance with the rubricator (second level);

a directory of lists (classifications and nomenclatures) used as the facets in the mask-positions (third level);

the lists, or classifications and nomenclatures (fourth level).

The subjects of the SKTESP are the rubrics (subrubrics) in the rubricator, the mask-positions in the directory of index types, the titles and codes of the lists in the directory of lists, the titles and codes of specific positions in a particular list.

In order to maintain the classification system in a dependable and current state, an organized management and, thus, the creation of an appropriate system is necessary.

Analysis of the OKTESP has shown that alterations in one of its divisions frequently produce a multitude of changes in the others. Thus, changing the

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code of a list or its deletion from the directory of lists requires a changing of this code or deletion of the particular list in all the mask-positions (as many as 600) where it is used, as well as in the particular list of classifications and nomenclatures. A manual method of management of the OKTESP, particularly for entering such type of changes in the classification system, causes some difficulty.

The problem of management of the OKTESP can be resolved by means of a special automated management system (ASV) for the OKTESP.

The basic functions of the ASV OKTESP are:

preparation and creation of information files (standards) of the classification system on magnetic storage media;

gathering, checking and coding of information on changes in the classification system;

computer entry of information on changes and computerized inspection thereof, processing, and preparation for updating of the classification system;

actualization of the classification system;

periodic notification of the users of the system as to changes taking place in the system and information services handling onetime requests;

creation and management of information reference files and archive information.

An important factor in the creation of the ASV OKTESP is a rational organized structure. Studies have revealed that the most rational structure for automated management of the OKTESP is a centralized one, with branches connected to a large number of sources and users of the information. The procedure for gathering, coordination and processing of changes in the OKTESP and actualization of the classification system [i.e., keeping it current] was defined on this basis.

The design of the automated management systems for the all-union classification systems presumes a creation of standard files of the classification systems on magnetic storage media. The question of the organization of the information has special importance for such classification system as the OKTESP. The volume and complexity of the classification system, the interdependency among its subjects both in the same division and in different divisions, the possibility of efficient access to the information and obtaining of appropriate output documents, and other factors should be taken into account.

For the automated management of the OKTESP, it is convenient to organize its information on magnetic storage media in the form of four files, each corresponding to a given level of the hierarchy. The files consist of records of

variable length, containing all the necessary information about the subjects of the classification system. The information of the files is sequentially organized.

In order to assure a mutual interdependency of the subjects in the directory of types of index and the directory of lists with the corresponding subjects of the rubricator, the structure of the records of the second and third level files include the codes of the rubrics (subrubrics), and for mutual interdependency of the subjects of the lists of classifications and nomenclatures with the subjects of the directory of lists, the structure of the records of the fourth level file includes the codes of the lists.

To prevent duplication and to reduce the information volumes, as well as simplify the technological process of the data processing, it has been proposed that the records of the second level files (the mask-items) containing the respective lists as attributes should retain only the codes of these lists, while their titles should be kept in the records of the third level file. Similarly, the records of the second and third level files containing items with references to the subrubrics (rubrics) also should not store the titles of these subrubrics (rubrics), but receive them when needed from the first level file (rubricator).

To keep the classification system current, a standard set of alterations has been developed, codes have been assigned for the altered items, and the set of items of each type of alteration and the structure of their arrangement on various data storage media have been determined.

All the alterations in the OKTESP can be reduced to four basic types:

incorporation of new subjects in the classification system;

removal of subjects;

alteration of certain items (title, references, etc.) of the subjects;

changing of the basic codes acting as identifiers of the subjects of the classification system (subrubric code in the rubricator, mask-item code in the directory of index types).

However, such types of changes may occur in any given division of the classification system: the rubricator, the directory of index types, the directory of lists or the lists themselves, i.e., in any level of file. Consequently, automated correction of the OKTESP also requires a knowledge of which file the given change refers to. For this purpose, each change in the classification system should have, besides a code for the type of change, a code marking the file for which the correction is intended. Thus, each change should have a two-place code, one bit of which indicates the level of the file being corrected, the other the type of change. The varieties of changes with two-place codes are known as the change types.

For the coding of the change types, it has been established that the marker of the file level should be in the first position of the two-place code, as this allows a certain simplification of the technology of actualization of the classification system.

In the process of developing the change types, the minimum of information necessary to correct the classification system and the informational structure are determined for each of them. Taken into consideration are the specific nature of the classification system, the informational and technological interplay of its subjects and divisions, as well as the demands for easy fill-in of the specially developed form "Bulletin of Changes in the OKTESP", minimization of the labor involved in compilation and checking of the bulletin, and the possibility of obtaining by computer the necessary information from the OKTESP for its actualization and formation of the bulletin "Changes in the OKTESP."

A consideration in developing the "Bulletin of Changes in the OKTESP" was the fact that this document should play the role of a mediator between man and computer. Therefore, the peculiarities of manual and machine information processing were considered in determining the format and structure of the bulletin, the method of arrangement of the data items of the classification system subjects in it, and the procedure of filling in the document with data. Given the convenience of transferring the initial data to hardware storage media, the form of the bulletin was designed to assure a unified model of such transfer for all types of changes.

The changes in the OKTESP arriving at the automated management system are transferred from the bulletin onto punched card or magnetic tape, using the type YeS-90U3 (YeS-9004) nonperforation data preparation equipment, and then entered into computer. To lower the likelihood of erroneous data and, thus, improve the reliability of the information keeping the system current, each change undergoes various kinds of machine checking during computer entry, in particular, making sure that the appropriate data are completely filled in and the mandatory processing characters are present, a value check of numerical information, a checklist inspection, and so on.

Incoming changes intended to correct certain subjects of the classification system often necessitate a correction of other subjects of the OKTESP. As an analysis revealed, it is advisable to transform such original changes into simple ones, as this minimizes the trouble of correcting the subjects of all divisions of the system. By simple we understand a change which results in correction of one or a group of sequentially arranged subjects of the system (incorporation of a new item, deletion or modification of the items of a subject).

The complex changes are transformed into simple ones by means of computer. For this, special directories have been created. Thus, given an original change calling for replacement of a rubric (subrubric) classification code by a new one, with the help of a special directory showing that references to the given rubric (subrubric) exist in files of the first, second and third

levels, the computer produces simple changes to correct the references at the corresponding positions of these files.

After processing the original changes and production of simple ones, the latter are arranged according to the corresponding attributes (keys) and a unified file of changes is formed, similar to a classification system in its organization and structure. Each record of this file is primarily intended to correct a single subject of the classification system. The records in the file are grouped as follows: first come all the changes involving the rubricator, then those involving the directory of index types, and so on. This enables an optimal process of correction of the system, i.e., keeping the OKTESP current in a single consecutive examination of the information of the files of all four levels.

In this case, the process of keeping the OKTESP current comes down to adding or deleting subjects from the system and replacing or modifying the individual data items of the subjects. For this, the records of the file of changes and those of the corresponding file of the classification system are examined and analyzed in succession, and the aforementioned steps are taken in dependence on the values of the codes of the change types. Thus, if a change has a code of type 12, 22, 32, 42, respectively, the particular subject will be deleted from the rubricator, the directory of index types, the directory of lists, or a specific list.

In the process of keeping the OKTESP current, information for the bulletin alerting the users of the system is produced on the basis of the file of changes and the corresponding data of the classification system.

All the aforementioned stages in the processing of the original data and correction of the classification system are combined into a unified technological process of automated management of the OKTESP. Besides the procedures pertaining to keeping the system current, the technological process includes a number of steps designed to solve the problem of answering requests, in particular, formation and distribution of a particular division of the OKTESP or its individual items.

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PROBLEMS IN THE FORMATION AND THE DEVELOPMENT CONCEPT OF THE ESTONIAN SSR GOSPLAN'S REPUBLIC AUTOMATED SYSTEM FOR CENTRALIZED MANAGEMENT OF CLASSIFI- CATION SYSTEMS

[Article by candidate of economic sciences Kh. P. Kaps and N. A. Myalson of the Computer Center of the Estonian SSR Gosplan]

[Text] The experience in developing the first and second stages of the Republic Automated System for Management of All-Union Classification Systems of Technical-Economic Information (RASVOK TEI) in the Estonian SSR Gosplan and the results of their operation have brought to light the merits and de- fects of the system and established the basic lines of future development of automated management of the systems.

The central element of the RASVOK TEI software is the SUBD OKA. This required considerable outlay of machine time and manpower in the entering of the clas- sification systems, as well as a large outlay of paper. With respect to user services, the system did not permit a retrieval by name of an item code or production of various selections corresponding to the interests of the users, which had a negative effect on the efficiency of the request handling.

The Republic Automated System for Centralized Management of Classification Systems (RASTsVK), under development in the 12th Five Year Period and relying on the experience of the RASVOK TEI, is to provide a centralized gathering and multipurpose collective utilization of classification system databases in the republic-level economies. Therefore, with respect to software, the database of the classification systems is translated from the SUBD OKA to the UNIBAD. This will provide the users of the system with complete and reliable informa- tion in a more efficient manner and enables the use of available information files for solving the problems of the ASPR of the Estonian Gosplan and the tasks of the RASTsVK.

With regard to hardware, the YeS-1033 computer will be replaced by the YeS-1045 at the computer center of the Estonian Gosplan. The higher level of hardware will allow organization of automated work stations (ARM) for the users of the system, and also provide a link of the users to the Republic Data Transmission System (RSPD).

On the basis of the development concept of the RASTsVK, the software will allow:

loading of OK TEI [all-union classification systems of technical-economic information] into the database and changes in the latter from magnetic tape of the GNITsVOK;

loading of classification systems and changes in them prepared on magnetic tape in the GNITsVOK formats;

entering of annotations and comments regarding items of the classification systems from display screen;

correction of texts of the classification systems from display screen (in terms of the primary code of a position);

magnetic tape output of classification systems and changes in them in the GNITsVOK formats;

archive services, indicating the date of changes;

production of a standard printout of classification systems in ascending order of primary code in full volume, over an interval of codes or at certain positions specified by the user;

output of a catalog of classification systems loaded into the database on display screen and printer;

production of a printout of a classification system in the format specified by the user with sorting in terms of any given code or attribute (e.g., alphabetic text sequence);

display screen and printer output of annotations of the classification systems;

sampling of certain positions of a classification system from display screen for printing in the format indicated by the user;

display screen and printer output of revised items of a classification system over a certain period of time, indicated by the user;

selective notification of system users as to changes in the classification systems;

formation of special nomenclatures for tasks to be solved in the RASTsVK network, for files, and for printer;

retrieval of an item code by name from the display screen with printer output if required;

inspection of codes, addition of check numbers;

during correction of texts of classification systems, printer output (by user request) of only the classification system items being corrected;

protection of data against unauthorized access;

transmission of information by communication channels.

In 1986, the translation of the classification systems to the database of the UNIBAD system and the development of the software section for management of classification systems in the RASTsVK should be completed.

CONCERNING ONE METHOD OF COMPRESSION OF THE TEXT OF A CLASSIFICATION SYSTEM ITEM: SURVEY OF EXISTING COMPRESSION METHODS

[Article by A. V. Goroshetchenko of the VNIIPTIK VASKhNIL]

[Text] The intensive use of computers in all branches of the economy brings to the fore the problem of simultaneous use of information files by a group of users. If the files are kept on magnetic disk type medium, the time for retrieval of a required file element is determined by the mechanical proper- ties of the access device. For modern magnetic disks, this is around 12.5 ms and cannot be substantially reduced. Thus, with a sufficiently large number of users of file elements in arbitrary time intervals, the machine time con- sumed in their servicing is greatly increased. There will be insufficient time to handle tasks requiring large volumes of computer memory.

A possible solution to this problem is improvement in the computer performance or use of special methods of information storage to enable working with larger information volumes (or independent self-contained portions thereof) in the main computer memory.

One of these methods is the method of text information compression, presented below. The essence of the method consists in replacing a word (combination of words, combination of letters) by its number in a dictionary, consisting of groups of words (subdictionaries) having the same length. This has been tested out by the All-Union Scientific Research and Design Development Institute of Cybernetics (VNIPTIK) of the VASKhNIL with the files of the sector classification systems and class 97 of the all-union product classifi- cation system "Products of the Plant Growing Sectors."

A large number of methods of text information compression are known at present. These are generally based on the method of optimal coding. A practical implementation of optimal coding is the familiar Hoffman method. This involves assigning short code combinations to characters (groups of characters) occurring with high frequency. However, the decoding time in this procedure is much greater than the coding time. In a quasioptimal text compression method [1], codes of varying length are used for words, carrying information as to the length of the word. The so-called quasi-optimum code (QOC) does not minimize the redundancy of each word, as is achieved in the

Hoffman method for a language in which the probable distributions of words obey the Zipf-Mandelbrot law, but the speed of coding and decoding in this method are greater than in the Hoffman method. With this code, the volume of English text is reduced by a factor of four.

The main bulk of the work in text compression is addressed to using codes of variable-fixed length, which substitute a single character for a group of characters (words) most often occurring in the text. For example, use of the Cooper method in an alphabetic dictionary makes it possible to eliminate repeating parts of words by replacing them with a reference to the repeating part of a previous word. The advantage of this method will be greater as the paradigm (group of words having the same root) is larger in the dictionary and as the average word length is longer. The drawback of this method is that the appearance of a new word results in a separation in the dictionary and a replacement of the word numbers.

In general terms, the criterion for retrieval of stable combinations of characters (words) is the fundamental theorem of Shannon, according to which an original text can always be broken up into separate blocks, assigning these blocks optimal code combinations (numbers) and thereby achieving a near-optimal coding, i.e., obtaining the maximum mean entropy per binary digit. Thus, in the works of Yanna Rudakis, et al., [2], it is proposed to examine equally-probable distributions of groups of characters (an equal probability increases the entropy and thereby reduces redundancy). An algorithm for generation of combinations of equally-probable groups of 64, 128, 256, 512 and 1024 characters is briefly described. The entropy in the thus obtained chains is near maximum.

The work [3] is devoted to a survey of a number of methods of text compression using codes of variable-fixed length (besides the above methods). The essence of the method considered here comes down to using a 4, 8 and 16-bit alphabet for coding the most common characters and combinations of characters. In order to save on memory, it is proposed to group together characters of identical length. Different methods are proposed for the selection and use of this alphabet. One such method is the generation of character strings used in large volumes of text. For example, a line of three characters from a string of 40 characters can be represented as a number in base 40, thereafter being stored as a number in the range of 0 to 40^3-1. Since $40^3-1 < 2^{16}$, this number can be stored in 16 bytes, whereas the 8-bit representation of the character requires 24 bits. The effectiveness of this method is greater as the length of the character string is longer.

The greater portion of the works examining the subject of text compression are devoted to the selection and organization of the transmission of a character string. Thus, it is possible to add individual characters to a selected string of initial characters, whereupon the new character is attached to a pair of existing characters similar in frequency of occurrence [4], e.g., by scanning the text and using a counter of the frequency of existing characters. The pairs which reach a given threshold of frequencies are combined in dependence on the position they occupy in the text. As a result, combina-

tions of characters with high frequency are formed and the process repeats. This algorithm has been upgraded in [5]. The compression in such method reaches 54.2 percent. The time for text compression and creation of a dictionary amounts to roughly 25 μs per character.

The considered methods of information compression are able to produce compression characteristics more or less near the theoretical. In the majority of cases, these methods are based on working directly with the original text. Therefore, they presuppose a repeated scanning of the text, identification of stable combinations of characters and determination of the frequency of their occurrence. If the frequency is part of the given range, the combination is entered in the base alphabet. The degree of text compression depends on the accuracy of the specified range (frequency), i.e., the computer resources, in the final analysis. Different degrees of approximation may produce different results. It is therefore advisable to employ a text compression method which takes account of the frequency of occurrence by replacing the words (combinations of words, combinations of letters) with numbers in dictionaries of words of fixed length, specially created for this purpose.

The above method enables a practical implementation of the other methods described above. The detailed presentation of this requires an independent description.

BIBLIOGRAPHY

1. Matsuo Fumihiro, Futamura Shooichi, "A Quasioptimal Method of Text Compression", DAY 18 KAY DZYOKHO KAGAKU GIDZYUTSU KENKYU SYUKAY KHOPPYO RONBUNSYU, No. 18, 1981, pp. 267-272.

2. E. J. Yanna Rudakis, P. Coyal, J. A. Huggill, "The Generation and Use of Text Fragments for Data Compression", INFORMATION PROCESSING & MANAGEMENT, Vol 18, No 1, 1982, pp. 15-21.

3. D. Cooper, M. F. Lynch, "Text Compression Using Variable-To-Fixed Length Encoding", JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE, Vol 33, No 1, 1982, pp. 18-31.

4. Wolff, J. G., "Recoding of Natural Language for Economy of Transmission or Storage", COMPUTER JOURNAL, Vol 21, No 1, 1978, pp. 42-44.

5. Ch. Weatherell, "Etyudy dlya programmistov" [Essays for Programmers], Mir, M., 1982.

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PROBLEMS OF ASU IN MOLDAVIAN AGRICULTURE

Kishinev SOVETSKAYA MOLDAVIYA in Russian 30 Jul 86 p 2

[Article by T. Platonova, candidate of economic sciences, senior scientific associate, Scientific Research Institute for the Economics and Organization of Agricultural Production, Moldavian SSR Gosagroprom, under the "Scientific and Technical Progress: Practice and Problems" rubric: "Based upon ASU"; the first two paragraphs in boldface in source]

[Text] The intensification of modern agricultural production and its integration with the processing industry has presented very acute management and planning problems to the agroprom system. Their successful solution in order to obtain high final results is very closely linked to the use of electronic computers and mathematical economic methods. There were thus reasons to expect big results from the introduction of ASU [Automated management systems]. It was supposed that ASU would help rationalize the management process, improve the timeliness, quality and substantiation of decisions by supplying the management process with timely and sufficient information.

However, the effect from the introduction of sector ASU has been less than expected.

In our view one of the main reasons for this is the existing technology for the collection, processing and storage of statistical data. The labor and time required to prepare data for technical media completely negates computers' potentials for rapid processing. Also, when data is transferred from one type of machine to another it has to be rewritten, recoded and again entered. This complicates things because various modifications of data file formats are incompatible. The main attention was given to the development of the technical base, while questions in the organization of data files were not solved. This reduced the results from the introduction of ASU. The departmental fragmentation which existed in agriculture restricted data exchange.

Another reason why the ASU designed and developed in the republic did not do much to improve management processes is that the main orientation was towards computers. Different management functions were viewed separately. Special subsystems, which did not interface well with each other, were created for each of them. The first to be automated were tasks in the lower management

levels in order to eliminate routine labor. These were mainly tasks in direct record keeping, not requiring the extensive use of mathematical economic methods. As a result, ASU tasks for higher management levels were forgotten. Their standards of design and introduction are not very high even now. The analysis of production efficiency using statistical methods is not widely used. Experience in this has been acquired in many republics, in particular, Latvia. Optimization methods for balance calculations are not often used.

Thus, experience in the functioning of the ASU's first section shows that with such an approach to introduction the really serious tasks in management remain unsolved.

The technology of data processing on computers also needs improvement. The applications program packages which are still being developed mainly support the so-called line technology. It is characterized by the following: the collection of statistical and other data, entry into computers, processing with the help of various types of relatively simple arithmetic procedures and the printing of results in tabular form. Technical workers develop designs separately for each task. The low level of standardization complicates the transfer and exchange of information between computers.

All types of computers are supplied with software. Their use leaves much to be desired. For example, the software for machines in the YeS series has a large arsenal of statistical methods. Of these, only correlation and regression analysis and time series processing are used, for the most part in scientific work.

The modest effects from the introduction of ASU are also explained by the personnel problem. Computer production and steady increases in their potentials are a still outstripping the training of personnel to use them. In the agroprom system there is uneven availability of skilled personnel in various levels. Engineers, programmers and applied mathematicians trained at the State University imeni V. I. Lenin work at computer centers. The Polytechnical Institute trains engineers to operate computers. The situation is more difficult with regard to the posing, development and operation of ASU tasks. Apparently, in servicing the management apparatus greater attention must be given to the retraining of specialists working in management.

Other tasks must be solved in order to improve the efficiency of computer use. In particular, the methodology for the complete transition from traditional management methods to automation, where a regional agro-industrial complex is functioning, should become the object of serious scientific research.

Functionally, a modern ASU should supply information to the apparatus for managing the republic economy. The creation of a republic collective use computer center will improve the potential for information exchange and its integrated analysis. Under such conditions it will be possible to formulate a unified methodological aproach to creating automated data banks.

The unification of means for developing machine programs and the maximum simplification of programming languages will help increase the adaptability of applications software. It is advisable that the class of YeS machines working

in the agro-industrial complex have a unified collection of applications programs to perform the main operations: the input, output, storage and processing of information. There should be more active development of applications programs in statistical data processing, making possible the wider use of methods such as factor analysis, multidimensional grouping and others. This will permit more thorough economic analysis and the preparation of various types of analyses for the management apparatus.

It is now necessary to master new, nontraditional ways of processing information, oriented towards future types of computers, mini and micro computers. These machines are relatively low cost and can be equipped with peripheral devices. Their use, together with presently operating computers, will reduce the time needed to handle tasks, lower processing costs and help accelerate the intensification of management labor.

The basic tool in long term planning should be automated systems for accounting, making it possible to create individual models and systems of models. A model developed for one rayon agro-industrial complex can easily be used in another one with a similar production structure.

The implementation of these tasks entails definite costs at this stage. However, in the future it will give good results and help improve planning and management at all levels in the agro-industrial complex.

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MOSCOW NOTES PROGRESS IN DEVELOPMENT OF ARTIFICIAL INTELLIGENCE

Moscow International Service in Polish 1300 GMT 25 Sep 86

[Text] Scientists from the Moscow Institute for the Construction of
Machines for the Electronics Industry have built an intelligent computer,
which replaces the knowledge, the experience and even the intuition of the
engineer who is creating complicated micro-diagrams (mikro-schemat). At the
moment it is only designing its future, perfect, brothers--the computers
of future generations. Scientists are, however, certain that its talents
will grow from day to day.

In one of the institute's laboratories ordinary monitors stand on special
transportable tables. The monitors are linked to a processor in the next
room. Presenting the capabilities of the computer, its creator, Professor
Yevgeniy Gloriosov, sitting by the monitor, inserts a technical program into
the computer. The program contains the attributes and characteristics that a
future micro-diagram should possess. There, the screen remains blank for a
moment. The machine is plunged in thought. Shortly, however, the greenish
screen of the monitor is, in a flash, filled with complicated diagrams--
made up of signs of various radio parts that go toward making up the diagram.

Our intelligent computer is fundamentally different from the systems of
automatic design known to date, explained Yevgeniy Gloriosov. It does not
stop at the analysis of different versions, humbly offered by the electronic
memory, but itself synthesizes original technical solutions. At the basis
of this electronic brain lies the principle of evolution, that is that of
the natural selection that is constantly taking place in nature. Analyzing
an enormous amount of patented information, the intelligent computer chooses
only the most promising solution, creating, on this basis, its own, the
most rational, in its opinion, diagram for designing computer and radio
appliances.

The wide-ranging application of these kinds of machines in the national
economy will perhaps bring about a real revolution in building and engineering
works. These intelligent machines will not only accelerate and lower the
working-out costs of electronic digital computers but will also allow us to
avoid technical mistakes during the design stage. The designer often does
not have the ability to work out in detail all existing versions and is forced
to choose one of those most acceptable. The intelligent computer is one of

the most modern examples of how, in raising the intellectual capabilities of digital computers by making their functioning more complicated, Soviet scientists create computers that have artificial intelligence. Among the nearest contemporaries of the present intelligent computer one could mention the computer-composers that create pop music in no way worse than a human composer, or language-machines that can take the place of a translator. An electronic chess player, created in the Soviet Union, last year won first prize among computers that can play chess.

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BROCHURE: PROBABILITY AUTOMATONS AND PROCESSORS

Moscow NOVOYE V ZHIZNI, NAUKE, TEKHNIKE: SERIYA MATEMATIKA, KIBERNETIKA in
Russian No 6, 1986 (signed to press 3 Jun 86) pp 1-2, 48

/Annotation and Table of Contents of article by R.G. Bukharayev: "Probability
Automatons and Processors," Znaniye Izdatelstvo, 34,700 copies, 48 pages

/Text/ Annotation

This brochure provides a brief introduction to the theoretical problems of
probability automatons and to questions concerned with the design of
probability processors and computer systems, intended for the effective
simulation of random events, values and series. A great amount of attention is
being given to the applications of and prospects for the use of probability
calculations on computers.

This issue is intended for lecturers, teachers and students at national
universities.

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NUMERICAL METHODS OF ANALYSIS OF ROUTING PROCESSES IN COMPUTER NETWORKS

[Article by V. S. Gladkiy and S. L. Gavliyevskiy]

[Abstract] A number of routing methods for cellular computer networks have been suggested. Until recently, practically the only means of numerical analysis of routing processes in networks has been the method of statistical simulation. Recently, attempts have been made to use classical numerical methods of linear algebra and mathematical physics to analyze network exchange processes. This article studies routing processes in packet switching networks, comprising systems of equations allowing numerical estimation of routing process parameters. Equations are derived for construction of a matrix of transition probabilities and situation tables and description of routing processes in a network. Examples of numerical analysis are appended. Figures 3, references 12: Russian.

PROBLEMS WITH EXPANDING COMPUTER TRAINING AT MEDICAL SCHOOLS

Moscow MEDITSINSKAYA GAZETA 19 Dec 86, p 3

[Article by A. Krasnov, corresponding member of the USSR Academy of Medical Sciences, president of the [Kuybyshev] Medical Institute; I. Korolyuk, professor, head of the Institute's Chair of Roentgenology and Radiology, Kuybyshev]

[Abstract] On the basis of experience of the Kuybyshev Medical Institute, the authors discuss problems and ways of improving computer training at medical higher schools.

For modern computer technology to be employed effectively in training courses and clinical practice, future physicians must know how to interact with computers and be familiar with the principles and main types of information and computer technology used in medicine, according to the authors. However, computer-literacy programs at medical higher schools are currently handicapped by inadequate resources. There is a shortage of instructors with suitable qualifications, particularly in the field of computerized information processing, and modern training equipment is costly, the authors explain. They estimate the cost of equipping a single video-terminal class at the Kuybyshev Institute to be about 100,000 rubles, an amount which exceeds the institute's entire annual budget for acquiring equipment. They say that medical institutes particularly need DVK-2M computer complexes for video-terminal classes, as well as versatile microcomputers such as the "Elektronika DZ-28", "Elektronika-60", "Iskra-226" and "Iskra-1256" which can be used to develop a wide range of learning and testing programs.

The authors complain that institutes are not receiving enough assistance from central organizations in solving these problems. They cite the example of an interchair curriculum, "Principles of Computerized Processing of Medical Information and of Computer Technology", which was approved recently by the USSR Ministry of Public Health's Main Administration for Educational Institutions. This curriculum emphasizes theoretical training at the expense of clinical information processing, which the authors call the most important and difficult part of the discipline. It is allotted only 25 percent of study time.

This curriculum is contrasted with an interchair curriculum which has been prepared for adoption on a temporary basis at the Kuybyshev Institute. It

calls for theoretical instruction to be provided by the institute's chairs of physics, biology and physiology, and for clinical information processing to be studied in the chairs of propedeutic therapy and of roentgenology and radiology. The authors suggest that the latter become the institute's chief division in this field, since radiology is the area of clinical practice in which computer methods (computer tomography and topometry, processor analysis of radioimmunologic studies, etc.) are employed most extensively.

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COMPUTER CAMP AT PERESLAVL-ZALESSKIY DESCRIBED

Moscow SOVETSKAYA ROSSIYA in Russian 1 Jul 86 p 1

[Article by P. Nikitin: "The First Computer..." under the rubric: "An Experiment in the 'Young Programmer' Pioneer Camp"]

[Text] I returned from Pereslavl-Zalesskiy, from the USSR Academy of Sciences' Institute for Programming Systems, in a festive mood created by what I had seen. A Pioneer Camp was opened at the Institute. It was hardly an ordinary event, but the camp itself is unusual. It is a computer camp. "Young Programmer" is its name. During their stay at the camp young people will do exercises in basic informatics and programming. There are 3 classes and 50 modern personal computers at the service of the little ones. The idea of creating this camp belongs to A. Aylamazyan, doctor of technical sciences and director of the Institute for Programming Systems. The idea was warmly supported by Ye. Velikhov, vice president of the USSR Academy of Sciences.

Ye. Velikhov said "This camp is the first experiment. It deserves general attention and support." Unfortunately, today training in informatics at schools is, in many cases done on the fingers. There is no working base -- computers. Soon, by the end of the five-year plan, the situation will improve. During this time it is necessary to do a huge amount of preparatory work and, in particular, to solve a complex problem which is unprecedented in world educational practice -- create a metnodology for teaching school subjects with tne help of computers.

The computer should be a natural and organic part of the educational process. This is now being worked on by USSR Academy of Sciences institutes, including the one at Pereslavl. The people at Pereslavl viewed the camp as a training ground not only for already developed methods, but for finding new ones. All the material obtained will be the basis for research conducted by the institute.

"We did not specially select children for this camp," A. Aylamazyan explains. The majority of them are meeting computers for the first time. Computers' truly limitless potentials will be demonstrated to children during the exercises. With their help the pupils will draw, compose music and even solve national economic tasks within the bounds of their capabilities. On the machines young people will calculate the optimal schedule of city bus traffic,

and help the Noviy Mir Factory create interesting graphic programs for sewing machines.

[Question] Can the path from the ABC's of computer literacy to the solution of quite difficult tasks be traveled in only three weeks at camp?

[Answer] Yes. We have gathered together pupils from the 5th to the 8th grade. This is the most immediate environment, receptive to any new exercise. People who are competent, enthusiastic and full of ideas will work with them.

Academician Velikhov added to what Aylamazyan had said, "I am convinced that before too long such camps will cease to be rareties."

The computer camp is located in an ancient land, on the shores of the famous Lake Pleshcheyevo. Here, three centuries ago, the young Tsar Peter built the "poteshniy fleet" [boy-sailors], which became a prototype for the future Russian naval fleet, covered with glory. In his greetings to the children Ye. Velikhov recalled this and called the camp's opening a "small historical event."

Well, keep this date in mind: in August 1986 on the shores of Lake Pleshcheyevo a children's computer camp was opened, the prototype for computer schools in the 21st Century.

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PROGRAMMING LANGUAGE IN RUSSIAN DEFENDED

Tbilisi PRAVDA VOSTOKA in Russian 12 Aug 86 p 3

[Article by U. Mannanov, docent, Department of Technical Cybernetics, ASU Faculty, Tashkent Polytechnical Institute: "Computer Language, What Should it Be?"]

[Text] School or higher educational institution teachers have the same task -- training educated and skilled specialists for the country. The main task today is to assure universal computer literacy as a component of general culture. Much depends upon the textbook. For a long time there has been a discusion about the text "Osnovy informatiki i vychislitelnoy tekhniki" ["Fundamentals of Informatics and Computer Technology"], for secondary educational institutions. It is edited by A. P. Yershov and V. M. Monakhov. The dispute has been conducted in newspapers, scientific journals and television. Most frequently critized is the presentation of a new algorithmic language in Russian. Why, they say, confuse pupils with a language for which there is no computer? Moreover, in the second part of this book, for 10th graders, there is instruction on programming in BASIC, and FORTRAN is also recommended. All of these are in English. For the unacquainted readers' information: Basic was developed in 1965 by J. Kemeny and T. Kurtz from Dartmouth College, while FORTRAN was developed by J. Backus and his colleagues back in 1957 (U.S.).

The question arises: Why, when solving the global task of computerization in our country and in implementing the school reform, do we start teaching the younger generation the ABC's of programming using an incomplete scheme? Let us discuss this briefly. The goal of the course in informatics fundamentals now taught in secondary schools is to help pupils overcome their fear of computer technology, give them a general picture of the world of computers and, most importantly, develop creative algorithmic thinking.

We use different means to reach this goal. These include programming, which has a deep and precise influence upon our way of thinking.

Consequently, in order to teach computer literacy, schools must have a programming language in Russian. In order to do this it is necessary to have a higher level programming language in Russian, model systems for computers,

including translators, compilers and interpreters in Russian and other languages of the USSR. It is necessary to implement them on domestic computers.

We are talking about education, which has always been and will be a national concept, in contrast to science and knowledge, which are always international.

Why should the English or American people think and program in their native language, while we do not!

One should not forget that massive education is under way in our country. Only in 1985 did we set up a course on the fundamentals of information science and computer technology for about 4 million students. In the third and final stage of the school reform, which we plan to reach in the middle of the 1990's, it is planned to teach this course not only in upper and middle classes, but also at earlier classes. This means that in 8-10 years the overwhelming majority of our Soviet society will master computer thinking.

We must develop our own programming industry and not simply copy the West. Then we will not have to play catchup (again)!

IDEAL COMPUTER CLASSROOM DESIGNED

[Editorial Report] Ashkhabad MUGALLYMLAR GAZETI in Turkmen on 30 July 1986 carries on page 2 an 1100-word article by A. Durdyyev, an inspector for the TUSSR Ministry of Education, and N. Musalyamov, chief of the technical department at the Ashkhabad Computer Repair Factory, discussing requirements of computer classrooms designed for the teaching of computer skills in secondary schools. The rooms must have space for 9 to 12 students and be equipped with computers, one computer printer, a television monitor for demonstrations, a film projector, screen, and a blackboard. The room dimensions should be 6 by 8 meters. Room temperatures must be maintained between 19 and 21 degrees C and humidity should be kept between 30 and 45 percent.

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KASSR: PROBLEM OF EQUIPMENT IN COMPUTER TRAINING

[Editorial Report]   Alma-Ata SOTSIALISTIK QAZAQSTAN in Kazakh on 1 August
carries on page 4 a 1,400-word article by S. Yegisbayev, chief of the
Information and Computer Technology Fundamentals Division of the KaSSR
Ministry of Education, published under the rubric "School Reform--a Vital
Need," entitled "Students and the Computer." The article looks at the cur-
rent state of computer education in republic schools in the more than one
year since decisions were made to introduce computer literacy as a basic part
of the republic educational program.

According to Yegisbayev, equipment still remains a sensitive area in republic
computer training with shortages in many parts of the republic. However,
every effort is now being made to overcome the problem with some 6,000
computers--including some from Japan--purchased last year and purchase of
another 12,500 planned for this year.   Models mentioned are "Agat,"
"DVK-1.2M," "Iskra-226" and computers made by the Japanese Yamaha firm.

Also a problem in the computer literacy program are managers who fail to
realize the importance of computers and who, as a result, refuse to emphasize
the computer literacy program adequately. Yegisbayev concludes there are
still substantial under- or unutilized resources. He cautions, however, that
much remains to be done and that there is nothing easy about computer training.
Moreover, problems must be taken seriously if they are to be overcome.

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LEARNING OPERATING ENVIRONMENT AND MEANS OF ITS IMPLEMENTATION IN OS YeS

[Article by V. B. Dralyuk and R. R. Pashkova, Sverdlovsk]

[Abstract] A programming learning environment monitor is described which maintains a comfortable object-oriented dialogue with a user, showing a list of objects available to the user on the screen rather than the menu of commands traditional in such cases. Manipulations of the objects are performed by means of one-character mnemonic intructions entered by the user on the screen at positions next to the names of the objects to be manipulated. Objects may be static or dynamic. The list of static objects appears on the screen before the user begins working at the terminal, while dynamic objects appear as needed. This "object pool" can be modified as required. This learning environment was written to provide flexibility, the capability for adjustment and expansion on the basis of administrative requirements or methodologic decisions. Tables which can be modified by the system administrator determine the types of objects available to each operation, method of presenting information on the screen and the display attributes of the objects. This method of organizing the programming learning environment is used at the computer center of Sverdlovsk State Pedagogic Institute, and is planned for introduction at a number of schools and learning facilities in Moscow, Sverdlovsk, Omsk and Yuzhno-Sakhalinsk. References 3:   Russian.

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